

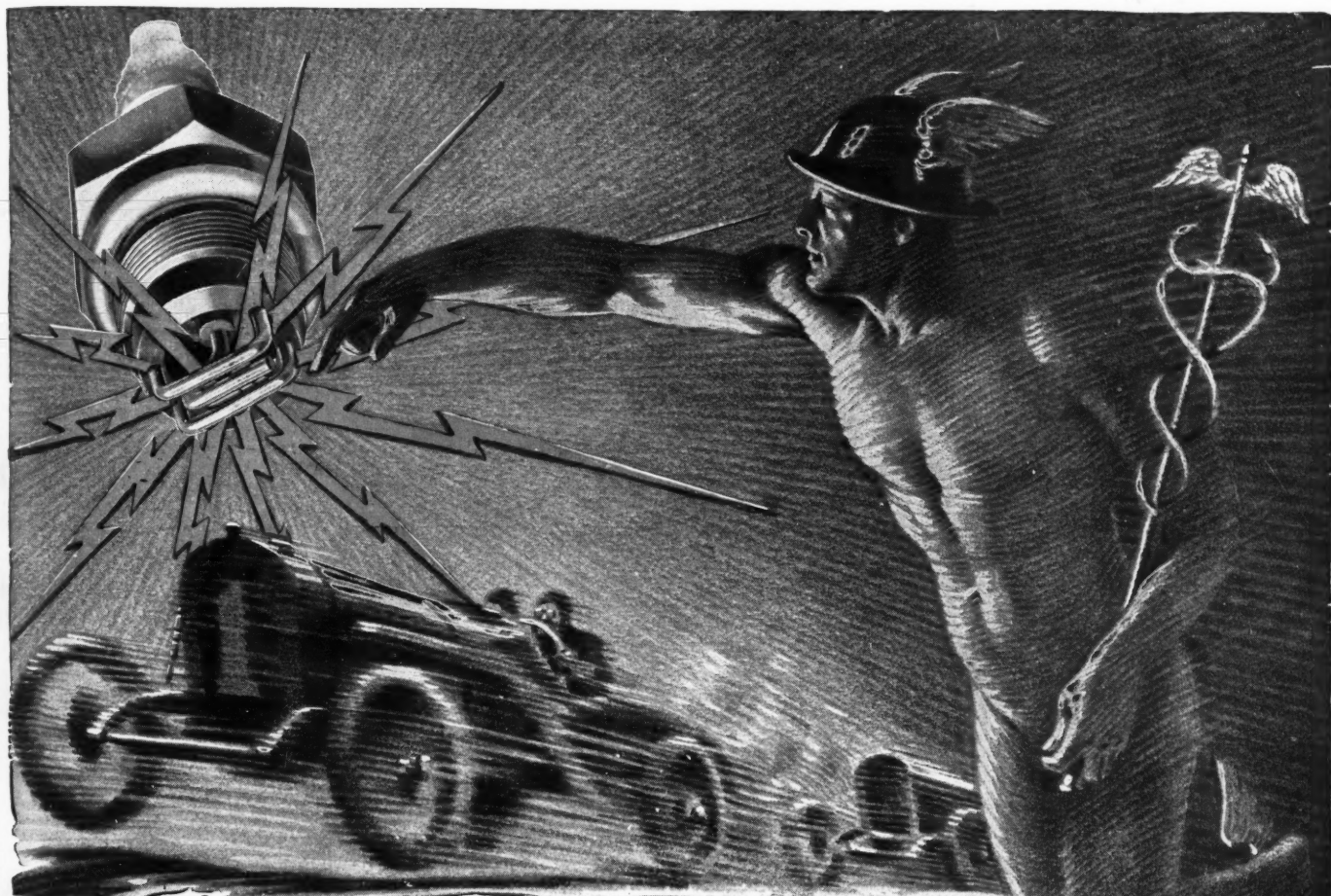
*Cleanliness in the Repair Shop*

# MOTOR AGE

Volume XXXVI  
Number 10

PUBLISHED WEEKLY AT THE MALLERS BUILDING  
CHICAGO, SEPTEMBER 4, 1919

Twenty Cents a Copy  
Three Dollars a Year



## THE REASON WHY!

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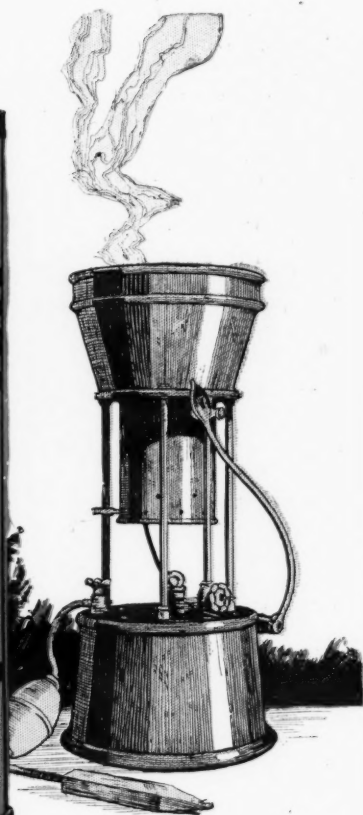
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**T**HE easiest and quickest way to repair leaks in radiators, pumps, hose connections, etc., is with Johnson's Radiator Cement.

It will stop leaks immediately without laying up the car—no mechanical experience required—all you have to do is remove the cap and pour the Radiator Cement in the radiator.



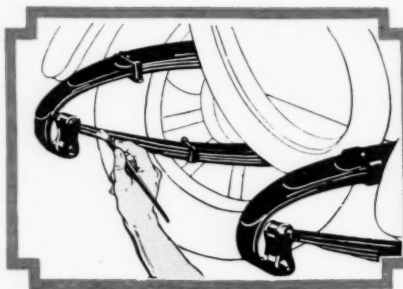
# JOHNSON'S RADIATOR CEMENT

Contains nothing which can clog or coat the cooling system and is absolutely harmless in every respect. It blends perfectly with the water until it reaches the leaks. Just as soon as it comes in contact with the air it forms a hard, tough pressure-resisting substance which is insoluble in water and consequently makes a permanent seal. No tool kit complete without a can of Johnson's Radiator Cement. Will ordinarily seal leaks in two to ten minutes. A half-pint is sufficient for the average car.



**Johnson's  
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A dose of Johnson's Carbon Remover, the engine laxative, will cure 80% of engine troubles. It will increase the power of your car—improve acceleration—stop that knock—quiet your motor—save your batteries—cut down your repair bills—and reduce your gas and oil consumption.



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**S. C. JOHNSON & SON, Dept. M.A., Racine, Wis.**

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### ELECTRIC AIR COMPRESSOR

#### WALL TYPE

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Lectroflater Electric Air Compressors are cooled by forced circulation of air all through the housing and will not overheat. This is a patented feature. There is no water to freeze up.

Grease lubricated throughout. No oil used. Leave factory fully lubricated and require repacking with grease only three or four times a year.

The motor is one-half horse power, and operates from an ordinary electric light socket on any current from Direct to 60 cycle Alternating.

Lectroflater Electric Air Compressors are made in different styles to suit various requirements.



May we send you complete information?

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Electric Valve Grinders

Electric Air Compressors

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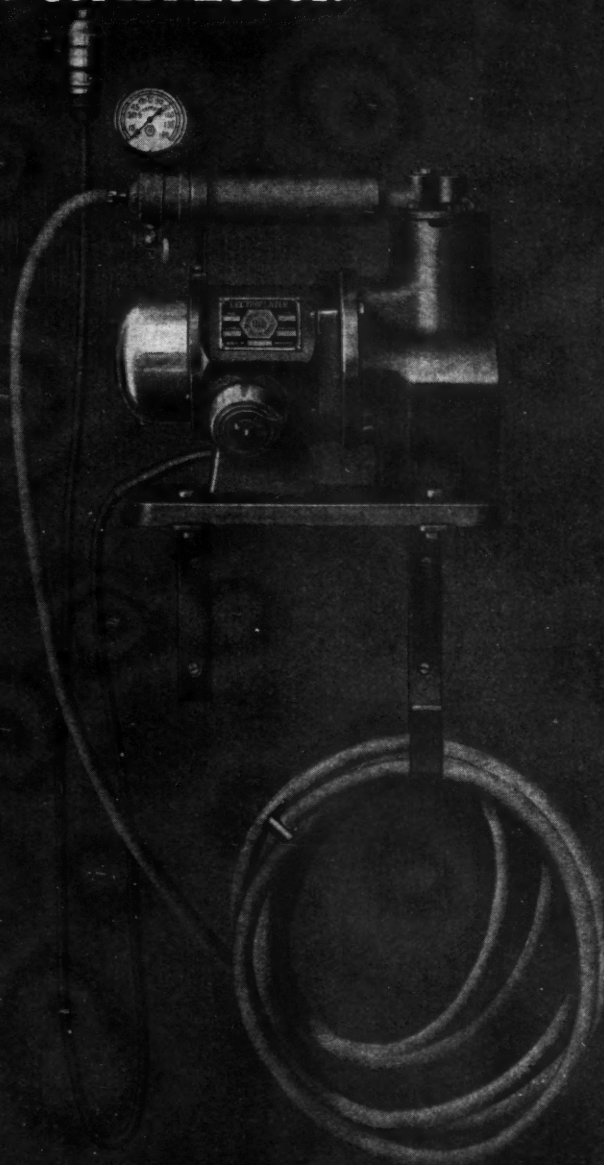
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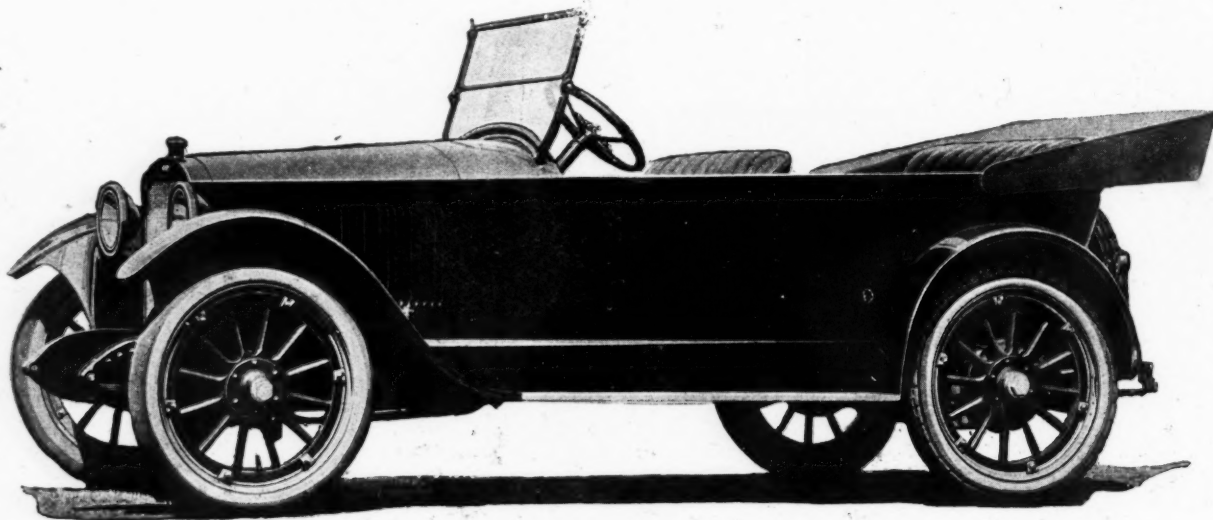
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## *Starting - Lighting*

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GRAY & DAVIS, Inc.

BOSTON, MASS.



# MOTOR AGE

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### MOTOR AGE

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Be SURE. See That  
Your Electrical Apparatus Is **NORMA** Equipped



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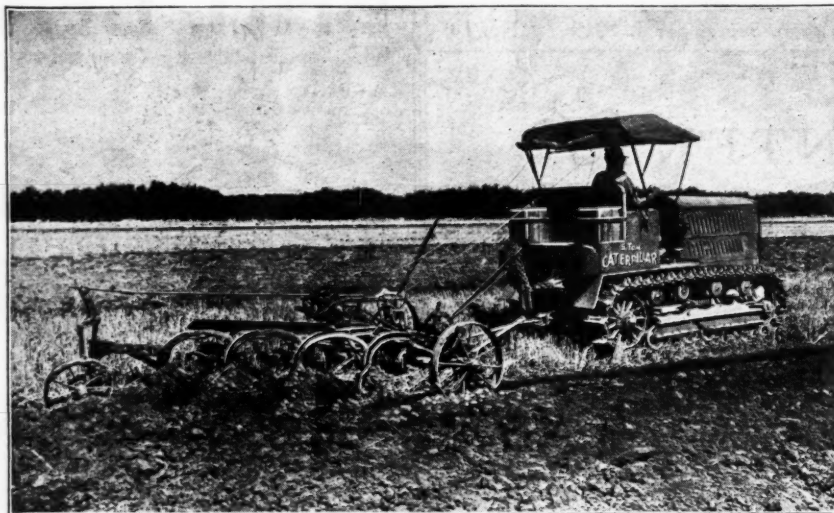
NEW YORK

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# The "CATERPILLAR" HOME AGAIN



In the past four years American tractor dealers have sacrificed considerable profit because the "Caterpillar" was exclusively engaged in war work.

That profit you can now regain.

The work of the "Caterpillar" in war is so familiar to American farmers and its proven capacity for work so much appreciated by them that a great and growing demand exists for the machine that turned out to be one of the most dependable pieces of Army equipment. *The 5 and 10-Ton tractors we are selling today are exact duplicates of the machines used in war work.*

A contract to sell "Caterpillars" will not interfere in any way with your contract for the sale of any good small tractor. The "Caterpillar" simply completes your line, giving you a tractor to sell to farmers whose work no other machine can do—a tractor on which you make a real profit.

Write at once for contract and terms. The public is waiting—we know that because so many inquiries are coming to us direct and so many sales are being made by dealers and distributors who have "Caterpillar" contracts.

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There is but one "CATERPILLAR"—HOLT builds it.

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## CLEAN UP

Recently the writer took a trip through central Indiana for the purpose of interviewing dealers and to learn how business was progressing. He found business very good, in fact, so good that every one seemed to be too busy to even think of keeping things a little tidy, to say nothing of sweeping up dirt, dust and sand that had accumulated on the floors.

Why, Oh why, will these men do everything in their power to get tourist trade to their places and then let them leave with thoughts about what they couldn't help but see even though the service rendered was satisfactory.

## CLEANLINESS IN THE GARAGE

This is the title of the lead article in this number and while it's very different from what usually gets first place we hope it will get the attention of some of those fellows who don't stop to think of what sort of an impression the appearance of their places leave with their customers.

Now that we got this cleaning thought off our minds we want you men who are rendering service to read three other articles in this number before going through the rest of the paper. The first is the article on the "Elevator Garage," the second "Lighting the Garage," and the third "A Car Washed Every 20 Minutes." You'll find that they connect pretty well with good system and efficient service.

## NEXT WEEK—THE IDEAL SERVICE STATION

After careful study and investigation we will present to our readers next week plans or layout for an Ideal Service Station. It will consist of layout of building with perspective, floor plan and elevation drawings, showing what has been found to be the best layout for salesroom, shop, offices, etc. This is to be supplemented in a later issue by a similar article and drawings on the shop equipment of the ideal service station.





AGENCY FOR SELDEN TRUCKS IN TOKYO, JAPAN

The Selden Sales Organization is world-wide in its scope—necessitated by the universal demand for SELDEN TRUCKS.

In most foreign cities of any size or importance, you will find SELDEN TRUCKS in operation. In many there are more SELDEN TRUCKS than any other make.

This widespread distribution of SELDEN TRUCKS alone is signifi-

cant of their merit and of the value the Selden Dealer Franchise.

Some of the largest and most successful distributors of motor trucks in the world are SELDEN Dealers.

We shall be glad to present the Selden Dealer proposition to motor truck or passenger car dealers or to interested capitalists in any territory where SELDEN TRUCKS are not at present being sold.

1, 1½, 2, 3½, 5 Ton WORM Drive Models

**SELDEN TRUCK SALES COMPANY**

ROCHESTER, N. Y., U. S. A.



1877-1891

The first gasoline motor propelled road wagon in all the world was a SELDEN. The present types of SELDEN TRUCKS are the product of 42 years of continuous experimentation, observation and experience in manufacture since the day of their inception in 1877.

# Selden Motor Trucks

# MOTOR AGE

## Cleanliness

*Is Essential to*

## Quality Service

- 1—Makes For Better Workmanship*
- 2—Advertises Wide-awakeness*
- 3—Is a Star Silent Salesman*
- 4—Induces More Efficient Management*
- 5—Holds the Clientele*
- 6—Makes Transients Permanent*
- 7—Is First Aid to System in Repairs*
- 8—Keeps Cars Sold; Sells More Cars*

### SERVICE STATION No. 1

- 1—Mechanics in dirty clothing.
- 2—Floor stained with oil and water.
- 3—Tools lying around on floor.
- 4—Workbenches covered with odds and ends.
- 5—Dirty windows.

**C**LEANLINESS is essential to quality service. Cleanliness in the repairshop is indicative of quality service in the repairshop. Certainly, quality service cannot exist long, if at all, without a certain amount of cleanliness in the shop.

Observation in any good service station will bear out these statements. The garageman or dealer who sets out to give service of that character which can be called quality service finds it pays in actual dollars and cents as well as in other ways which tend to gain.

Cleanliness means that the cars are stored neatly and no tools or equipment are lying about to interfere with keeping the floor clean. One service station requires a change of uniforms twice a week. Another paints its posts every Saturday night and finds the neat

### SERVICE STATION No. 2

- 1—Mechanics in clean overalls.
- 2—Floor swept and cleaned.
- 3—No loose tools in sight.
- 4—Workbenches washed and neat.
- 5—Clean windows.



appearance Monday more than pays for the extra trouble. In short, dealers and garagemen who have brought order out of chaos and in that order made cleanliness are of one mind—cleanliness means service, and better service.

Of the two typical service stations cited here, which would you as an owner patronize? Which would you as a dealer or garageman prefer to own? Let us consider briefly just what cleanliness in the shop does.

**1—Cleanliness makes for better workmanship.**

It has been found that mechanics in clean uniforms, or coverall garments, also keep their tools and equipment clean as a rule. A highly polished car and beautiful upholstery as a result is infrequently, if at all, besmeared with grease or oil from greasy tools carelessly handled. In addition it is easier for a workman to do good work on a car if his tools are clean, in their proper place, and his environment is such that goes with clean tools and equipment. "Keep clean and your work naturally will follow the same channels" is a slogan that hangs on the walls of one of the largest and most successful service stations in the country.

In this shop all the benches are covered with galvanized sheet iron and periodically cleaned. The walls of the shop are painted white and once a week the posts are painted "just to keep the place looking neat." There are places even for the small horses to put under cars when not in use so they are kept off the floor.

Cleanliness, in other words, makes for better workmanship because of the added ease and convenience everybody undergoes when working with the proper equipment and in pleasant surroundings. A service station cannot be pleasant and have water all over the floor, dirt in all the dark places and greasy rags, odd tools and, perhaps, discarded parts lying around.

**Appearance as Signboard**

**2—Cleanliness advertises the wide-awakeness of the shop.** It aptly has been said that the appearance of a garage is a highway signboard. No doubt you as a dealer or garageman believe in advertising in its various media. How often do you stop to think what kind of an advertisement does your shop give you?

Cobwebs in the window draw little but flies, and flies are no kind of customers for a repairshop. A neat, attractive accessory display in the window will draw customers, for even the transient customer is apt to stop at your place rather than next door if he sees a part he wants in your show window or sees a display that is alive enough to lead him to believe you have what he wants within.

Likewise, a clean shop draws the transient customer. Oh, yes, he can tell from the outside, on the road, somewhat of the appearance within, from the occasional mechanic standing outside or giving service at the curb, if from nothing else. The presence or absence of cleanliness in your shop has a great

deal to do with your reputation for being up-to-date.

**3—Cleanliness is the garageman's star silent salesman.** Just as it advertises your wideawakeness, so does it sell service and accessories for you.

**4—Cleanliness induces more efficient management.** Given a shop in which the workmanship is bettered in the first place by having clean tools and equipment and clean surroundings, which means a certain amount of system in itself, the management is bound to be much more efficient than if unfavorable conditions along this line were present.

By more efficiency here is meant the ability of the management to get quicker and more accurate service with the same means. Given a system that really functions, a certain amount of work will be turned out every day. With a management that makes the most of that system and, itself under favorable working conditions, equipment and personnel are co-ordinated to the advantage both of the customer and the shop owner.

**5—Cleanliness holds the clientele.** Unquestionably, the best criterion of the value of cleanliness in the repairshop is this. Put yourself in the car owner's place. Would you patronize a garage that sent your car back to you with grease smudges on the cushions, whose place always gave you an idea of unending chaos when you stepped in to inquire about your car or about a certain part that had to be ordered? Certainly you would not if by going a block farther down the same street you could find *quality service*.

**6—Cleanliness makes transients permanent.** Just as cleanliness in the repairshop holds the clientele so it adds to that clientele from the ranks of the chance owner who stops for an occasional repair, comes in for a part his regular garage does not have just then, or drops in for any of a dozen other reasons.

There are a lot of transients who might be called tourists even and still be among the possibilities as a future steady customer. Many car owners make short trips in the same direction the year around. If your place is neat and attractive, the service is prompt and satisfactory, those owners will soon get into the habit of stopping regularly, for oils and greases, gasoline, small accessories and what not, even when there is no question of an emergency repair.

**7—Cleanliness is first aid to system in repairs.** Just as cleanliness in the repairshop makes for more efficient management, so does it make for system. If a mechanic has to hunt all over the shop for his tools to make a necessary repair, if he has to work on a floor with pools of water or spilled oil, nothing is in its place and everything means a delay, system in that shop will be effective, will work, only on paper. There is a certain nobody-cares-what atmosphere about a shop of the unclean sort. System here is more than likely to be the hit-or-miss kind, a little system here but not a sign of system there.

**8—Cleanliness keep cars sold; sells more cars.** The fact is recognized that

every car owner is a prospect for sales in the future. In short, the more cars that are sold, the wider a field for the cars of the future. Particularly is this true in consideration of any one make. To keep the owner sold on that make he must have efficient and reasonably prompt service in necessary repairs and replacements on that car. To sum up, the owner is sold on his car according to the service he gets, and he is a future prospect to the extent that his present car satisfies, or, in other words, to the extent that, first, the dealer, and then the garageman sell him on his present car.

Let us consider the lack of cleanliness in the repairshop. Of all the crimes a service station can commit against its customers, the greatest of these is to maintain an unclean garage. There is nothing that gives a customer a worse impression of an institution than to have it turn out dirty work. And this is not an occasional error. It is a very common one. Yet most service managers think of this most important phase of their business last.

If you enter a restaurant and find dirty tableware, you immediately lose your appetite and wonder whether or not you should stick around and face the ordeal which your first impression of the place has lead you to believe is coming. There are many garages that give its customers this same impression on their initial inspection. And the other fellow with a nice, neat place gets the business and you wonder where he gets his drag. And he gets lots of business more than he can handle. Yet the fellow with the shifty garage will not look around and make comparisons between himself and the others that are doing business to find out where the trouble lies. Think it over.

**Appearance Counts**

*How often we have noticed a transient motorist drive up to a garage, give it the once-over and then pass on to inspect others.* The motorist knows from experience that if he can find a neat-appearing place, he also will get good, neat work done. If you have ever had that happen to you, walk across the street and give your place a critical inspection, just as a prospective customer would, and then figure out what you have to do to make amends with yourself and your business.

It's really marvelous what a few dollars worth of paints, several buckets of water and a few brooms will do for a garage. Let's don't do it once in the morning and then seek the easy chair, but let's keep at it. That's the way that people get things done in this world—by keeping at it. Some morning you will come to and find out your business is away beyond your fondest expectations.

While the exterior gives a visitor his first impression, the interior must be kept in harmony with the surroundings to carry out the ideas which have been fostered. This demands that the shop part of a garage be as neat as its salesroom and that the workmen be kept as neat as it is possible to do.

## The Ideal Service Station

**I**N these days of efficient service station management and layouts a good many dealers perhaps are wondering as to just what constitutes the ideal layout for a service station catering to average circumstances. By that we mean a service station such as a dealer would have in a town of 5,000 to 10,000 persons. Obviously service stations like those of New York and Chicago would not do for the dealer in the small town. In other words, the average dealer in the rural sections and smaller communities is governed by entirely different factors so far as his building is concerned than his fellow dealers in the big cities.

With this thought in mind we are going to show in next week's issue of Motor Age a ground plan, cutaway view and birdseye view of what we consider an ideal layout for a service station, based on conditions to be found in the average city of, say, 10,000 population. Of course, the layout will not fit all conditions, but we believe it to be a pretty good summing up of the practical points gained from studying service stations over a wide area of this country. There is a definite reason why the shop is located where it is, why the salesroom door is located just so and why the service manager's office was placed in the spot indicated on the plans. All these reasons will be gone into at length in next week's article. The dealer who expects to build in the near future might profit a great deal by going over this layout carefully.

### FORD COSTS \$1,100 IN ENGLAND

London, Aug. 9—Warren C. Anderson, the Ford company's new organizer of the British business, has just disclosed his policy. It embodies three important points:

An immediate reduction in price. Exclusive Ford agencies with a standard of service and garage equipment apparently based on the Ford company's American standard.

An expenditure of \$5,000,000 on the extension and remodeling of the present shops at Trafford Park, Manchester. It is contemplated to start production there of 25,000 cars. The present British prices of Ford cars are:

Touring car reduced from \$1,250 to \$1,100.

Ford van reduced from \$1,300 to \$1,050.

Ford chassis reduced from \$1,000 to \$850.

Ford town car, or landaulet, which has not been made for some time, but which is now again available, \$1,500.

Ford ton truck chassis is listed at \$1,000.

These prices are all quoted free on rail, or for delivery at the works, Manchester.

Further, the Ford Company is arranging for a series of all Ford depots in every important center in the Kingdom. A dealer who elects to handle Ford cars in future has to undertake not to handle any other make of car but to be an exclusive dealer, or to have premises apart from his regular

business specially fitted up with a qualified staff of mechanics, salesmen, demonstrators, etc., whose whole time must be given.

Under the new arrangement these Ford service depots will be restricted in their sales of Ford cars, inasmuch as they will only be allowed to sell the cars at the maker's fixed retail prices, thus preventing profiteering, to buyers within the district allotted to them, and even such district will not be restricted to them, as it is quite within the option of the Ford company to appoint one or more authorized Ford dealers in any one important center.

Authorized Ford dealers are called upon to undertake not to alter, or interfere with, or add to the design or working of, any Ford chassis.

The company is spending upward of \$5,000,000 on alterations, extensions and improvements to the Trafford Park factory, where it contemplates the manufacture this year of 25,000 cars.

### JOBBER HOLD DRAWING

Chicago, Aug. 29—The Automotive Equipment Association met at the Hotel LaSalle Wednesday to draw for space in the annual show which is to be held here Nov. 3-8. There were 114 drawings, and first choice fell to the Shurnuff Mfg. Co. A special committee has been appointed to allot spaces to exhibitors according to their standing in the drawing and their choices as to space.

### 180,000 CARS IN ENGLAND

London, Aug. 12—Motor Age of July 24 implies that the total number of cars in England at present is 411,791, this figure being arrived at by adding together the total issue of the various petrol licenses. There is a serious error here, however, because there were five series of licenses and many people had one of each series, so that on the basis of the reckoning above referred to, they would have figured in the total as having five cars instead of one.

One must also remember that those licenses were given on a diminishing scale as the situation became more rigorous and were finally only supplied to doctors and others who could prove stern necessity.

Actually we have great difficulty here in estimating the total number of cars running because our registrations are for the lifetime of a car and not for one year. In other words, when a car goes into use, it is given a number plate which it is supposed to continue through the life of the vehicle, and then if the vehicle changes hands, the new owner may take over the existing plates by payment of a fee or have his own new plates put on. So that here again is another complication. It is considered, however, that we have not more than 180,000 cars here and about 200,000 motorcycles, and this is about as good a guess as you will get on the situation.



# How Thefts Have Boosted Insurance

## Rate Increased 2000 Per Cent in Five Years—Ask Federal Bill

**S**T. LOUIS, Mo., Aug. 30—Car thefts have boosted insurance rates nearly 2000 per cent in five years. This is shown by the report to the N. A. D. A. from the Automobile Insurance Co. of this city which compiled its statements from records of St. Louis, Kansas City, Chicago, Detroit, Denver, Memphis and Wichita. The table, as given here, reveals the owner of the less expensive car as the principal sufferer at the hands of the car thief. In fact, rates on the larger cars have increased only slightly. The rates follow:

ST. LOUIS		
	1915	1919
Buick .....	\$ 4.25	\$45.13
Cadillac .....	12.00	30.00
Dodge .....	3.75	35.63
Ford .....	2.75	42.63
Packard .....	12.50	18.75
Pierce-Arrow .....	21.50	32.25
KANSAS CITY		
	1915	1919
Buick .....	\$ 4.50	\$42.75
Cadillac .....	9.00	22.50
Dodge .....	23.75	35.63
Ford .....	2.00	31.00
Packard .....	12.00	18.00
Pierce-Arrow .....	23.50	33.75
CHICAGO		
	1915	1919
Buick .....	\$ 3.75	\$35.63
Cadillac .....	9.50	23.75
Dodge .....	3.50	33.25
Ford .....	1.75	27.13
Packard .....	17.50	26.65
Pierce-Arrow .....	24.50	36.75
DETROIT		
	1915	1919
Buick .....	\$ 7.50	\$71.25
Cadillac .....	9.00	22.50
Dodge .....	3.50	33.25
Ford .....	1.50	23.25
Packard .....	20.00	30.00
Pierce-Arrow .....	20.00	30.00
DENVER		
	1915	1919
Buick .....	\$ 3.75	\$24.13
Cadillac .....	5.00	17.00
Dodge .....	2.50	16.25
Ford .....	2.00	21.00
Packard (1915) .....	15.00	15.00
Pierce-Arrow .....	20.00	20.00
MEMPHIS		
	1915	1919
Buick .....	\$ 4.50	\$27.00
Cadillac .....	7.50	9.00
Dodge .....	3.50	21.00
Ford .....	2.00	22.50
Packard .....	12.50	6.25
Pierce-Arrow .....	20.50	10.25
WICHITA		
	1915	1919
Buick .....	\$ 2.50	\$47.50
Cadillac .....	4.50	22.50
Dodge .....	3.75	35.63
Ford .....	2.25	34.88
Packard .....	22.50	33.75
Pierce-Arrow .....	19.25	29.88

### Inter-State Thefts

Cities that border on two or more states, it has been found, are the most fertile fields. Cars stolen in one state are driven across the line, and then the state in which the car was stolen is powerless to summon as witnesses the parties to whom the stolen cars are disposed of.

To correct this condition Representative Cleveland A. Newton of Missouri has a bill which he will introduce shortly to make it a federal offense to steal a car in one state and drive it into another. This would permit the trial court to summon witnesses from any

state in the union if necessary to procure a conviction. The bill is endorsed by the National Automobile Dealers' Association and the St. Louis chamber of commerce.

### STUDEBAKER EARNINGS MAY SET NEW RECORD

Suoth Bend, Ind., Aug. 29—New earning records, extending those of the year 1915, when 27.5 per cent dividends were paid on the outstanding common stock of \$30,000,000, may be made or closely approached this year by the Studebaker Corp. A. R. Erskine, the

## THREE CARS FOR BRITISH IMPORT PLAN

### Entry of 3,842 Ford, Studebaker and Overland Allowed

**W**ASHINGTON, Aug. 29—Although Great Britain has repealed all restrictions on the import of cars, trucks and tractors, it is reported the complete abolition of restrictions may be only temporary. A new ration plan allowing cars and trucks to be imported in proportion to the average number imported in 1912-15 may be adopted. Up to the present time imports have been rationed on the basis of 50 per cent of the 1913 imports in average monthly quantities up to Sept. 1, 1919.

Meanwhile the American Apportioning of the 5000 cars the British government will allow to be imported in addition to the former rationing has been announced as follows:

Ford .....	2579
Studebaker .....	769
Overland .....	494
Total .....	3842

At first it was presumed American factories would get the entire allowance of 5000, but the rest are to come from French and Italian makers. The American figures are proportional to the total imports during 1912-15.

American importers here have been greatly disappointed by the failure of the government to give them a definite statement on what they may expect in the way of business prospects beyond this allowance, which undoubtedly was made to meet partially the public demand for cars. British makers still are struggling with slow production and are keeping up demands that their industry be protected by keeping out cars of foreign makes.

president, announced that net profits, after deducting fixed charges, were more than double, for the first six months of the year, those for the same period in 1918. On this was based his assertion concerning the possibility of a new record for 1919.

The units of the plants under construction at South Bend will be completed next January, and shipments of cars will be started in April, with a total of 25,000 scheduled for shipment next year, which, added to 50,000 cars scheduled by the Detroit plants, makes 75,000 cars planned for production next year when, it is estimated, sales will exceed \$100,000,000.

Since July 1 production and sales show substantial increases and the demand is several times greater than factory output which, in the case of cars, has been running, and promises to continue at 4,200 cars a month.

### TRAFFIC CONVENTION PLANNED

St. Louis, Mo., Aug. 30—Traffic truck salesmen all over the country will hold a convention at the plant of the corporation in St. Louis Tuesday and Wednesday. Harry H. Hawks, general sales manager, who has been on a tour of eastern cities for several weeks, will return in time to preside. Short talks also will be made by President Guy Wilson, Vice-president T. C. Brandle and Secretary-Treasurer H. P. Mammen.

A feature of the convention will be a Mississippi River excursion, when the guests will be all the officials and employees of the corporation and their relatives. The boat has been chartered by Mr. Brandle, who will bear all expenses, in keeping with his promise to show everyone a good time for production work. The excursion also will be an au revoir party for Mr. Mammen, who will sail early in September to spend several months in Europe in promoting Traffic foreign interests.

### ORDERS FOR 30,000 CLEVELANDS

Cleveland, Ohio, Aug. 30—The Cleveland Automobile Co., although but a few months old and with its factory recently completed, has orders for more than 30,000 cars for the present year and has issued orders for increasing the capacity of its plant. The factory has been in production since July 31. On that day, 103 working days after the building was started, the first Cleveland six was completed and turned over to one of the distributors. Most of the distributors now have cars.

### OVERLAND DEALERS MEET

Chicago, Aug. 29—Overland dealers of Illinois and northwestern Indiana held a two-day business session here yesterday and to-day, President W. H. Taylor of the Chicago branch and his assistants were kept busy answering questions about the new light model which will retail at \$845. It was announced that quantity production on this model will be in full swing shortly.



A banquet was given last night at the Lexington Hotel. R. M. Fudge, Overland dealer for Gary and Hammond, Ind., gave a talk on service. He emphasized the fact that many dealers are giving immediate profits on car sales more concern than warranted and intelligent service to the purchaser should be uppermost in their minds. Other speakers were Capt. William Taylor of the Marines; John D. Strutzel, Overland dealer of Joliet and Rockford, Ill., and Mr. Clark of the Gillette Rubber Co.

#### STUTZ HAS CAPITAL APPROVED

New York, Aug. 29—Stockholders of the Stutz Motor Car Co. of America have approved previously announced plans by which the capital stock of the corporation will be increased from 75,000 to 100,000 shares of par value that the company's stated capital be enlarged from \$375,000 to \$500,000. These additional shares will be offered, at the rate of one new share for each three shares held, to stockholders of record on Sept. 17 at \$100 a share.

The new financing is to provide for the additional plant, doubling the company's output, under construction at Indianapolis. George F. Lewis, the secretary, announced that the present production of the Stutz factory was contracted for until August, 1920. The new plant is expected to reach production early next spring.

#### G. M. BUYS SAXON PLANT

Detroit, Aug. 29—General Motors has purchased the new plant of the Saxon Motor Car Corp. at Springwells. General Motors officials state that it has not been definitely decided just what will be done at the Saxon plant. It is generally reported, however, that the Scripps-Booth will be manufactured there, as for some time Scripps-Booth production has been carried on in other units of the General Motors plants which are over-crowded already with their own productions.

In all probabilities it will not be possible to determine just what will be done with the new Saxon plant until after it is entirely vacated by the government, which has been using it for storage purposes. Definite information as to when the government will withdraw from the plant is not available at present. Saxon is manufacturing in its Beaufait Avenue plant. Rumors which connected this concern in a merger with the Harroun company caused a lively action in both Saxon and Harroun stock, but nothing definite has transpired in this direction as far as can be learned at present.

#### RETIRED RACER IS KILLED

Paris, Ill., Aug. 29—Ernest McNees, retired racing driver, was killed Tuesday when his car crashed into a stone wall to avoid collision with a party of gypsies. McNees held the dirt track record at southern Illinois fairs.

## Willys to Concentrate on Two Models

### New Overland and Knight—Engined Four in Big Production Schedule

TOLEDO, Ohio, Aug. 29—Willys-Overland is clearing decks for big production. Its labor troubles are now virtually at an end and within another sixty days it is probable that not only will all the old employees be back but additional men will be at work. The decision to concentrate on two models, the Overland 4, which is the small poppet-valve four developed during the last three years, and the Willys four, fits in with the big production scheme now arranged.

The capacity of the Toledo plant, which is probably from 700 to 800 cars per day, doubtless will be taxed when the company is in full swing. The daily production for the early part of September will run about 250 to 300 Overland cars per day, this being rapidly increased until the ultimate schedule is reached.

Prices have been fixed on both the Overland 4 and the Willys-Knight, these being in accordance with the following:

#### OVERLAND

Touring .....	\$845
Roadster .....	845
Sedan .....	1,375
Coupe .....	1,325

#### WILLYS

Touring .....	1,750
Roadster .....	1,750
Sedan .....	2,250
Coupe .....	2,500

The Willys six, which will be manufactured by the Willys Corporation, probably at the Duesenberg plant, will be in production by January and exhibitions of the first models will be made at the New York show. Deliveries will probably start immediately thereafter.

#### TO MAKE FABRIC TIRES

Louisville, Ky., Aug. 29—The Ten Broeck Tyre Co. is equipped to build a fabric tire which will carry an 8,000 mile guarantee, a mileage warranty greater than that of any other fabric tire. Distribution plans are changed from those of the past in that the Ten

Broeck tires hereafter will be marketed through dealers. This decision is the result of a re-organization which followed the death of the former president, H. L. Lewman, and the resignation of the former manager, W. C. Lewman. Management of the company now is in the hands of R. J. Garrene, vice-president and general manager, with Walter H. Grote, assistant general manager and factory superintendent, and W. Z. Neden, general manager of sales. The new president is William Cox.

The plant is being equipped with new machinery, and an oversized type of mold and cord equipment is being installed. With the new equipment the present production of 500 per day can be doubled by the middle of September. One of the features possessed by the plant is the cotton mill in which the fabric for the new tire is produced, as will be the cords for the cord tire which is to follow.

#### NORTHWEST SHIPS BY TRUCK

Chicago, Aug. 30—Although little has been published concerning the ship-by-truck activity in the Northwest, a list of the lines operating in Minnesota, Wisconsin, the Dakotas and Montana shows forty lines operating regular routes in and out of Minneapolis and St. Paul and seventy-two lines in Minnesota alone. New lines are being established every month and in a short time there will be a network of such throughout that state.

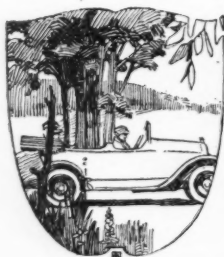
#### U. S. L. PART OF WILLYS CORP.

Buffalo, N. Y., Aug. 29—That the United States Heat & Light Corp. will be a unit in the new Willys Corp. has been confirmed. It is probable this concern will be considered the battery unit in the new corporation and will furnish the storage batteries for the Overland and Willys cars, as well as for the new farm lighting system.

#### BROWNE TO MARKET CURTISS PLANES

Milwaukee, Wis., Sept. 1—George W. Browne, pioneer Milwaukee dealer and distributor, who for several months has acted as distributor of the Curtiss airplane, has contracted to market the entire output of the Curtiss aircraft organization and will open headquarters in Chicago. Mr. Browne will divide his time between Chicago and Milwaukee and retain his interest in the Overland-Wisconsin Co., distributor of the Overland and Willys-Knight. His local aircraft business, incorporated as George W. Browne Airplanes, Inc., has been taken over by Lieut. Gilles Meisnerheimer, who has managed the business for Mr. Browne since its establishment in April.

THE immediate and pressing need of the country is production, increased and increasing production, in all lines of industry. The disorganization and dislocation caused by the war have told nowhere so heavily as at the industrial centers—in manufacture and in the many industries to which the country and the whole world must look to supply needs which cannot be ignored or postponed—Woodrow Wilson.



# EDITORIAL



## Locking the Stable Door

**W**HAT does it cost you to have the other fellow's car stolen? Nothing? That's where you are mistaken. For the records of seven cities, as given elsewhere in this issue, show that car thefts have boosted theft insurance rates 2000 per cent in the last five years.

✱ ✱

**W**HETHER your own car was ever stolen or not, whether it was stolen and you got it back or lost it permanently, the cost of the fellow whose car was stolen and the loss made good by some insurance company is being prorated at 2000 per cent over the rates of five years ago.

✱ ✱

**A**NY campaign against car thefts, any efforts to prevent cars being stolen, are as much to your advantage as it is to the owner who has lost one car by theft and never knows but what he will lose another car the same road any day.

✱ ✱

**C**ITIES that border on two or more states seem to be the most fertile field of endeavor for the car thief who is not the lily of this or any other field, for he toils

mightily to run up his lifting average and spins when necessary. Cars stolen in one state are driven across the line, and the state in which the car was stolen cannot summon as witnesses the parties to whom the stolen cars are sold. True, a bill has been drawn for introduction into Congress to make it a Federal offense to steal a car in one state and drive it into another.

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**T**HIS bill has been endorsed by the National Automobile Dealers Association, and should be supported by owners as well as dealers as an attempt to alleviate present conditions. Last year \$2,611,000 worth of cars were stolen in Chicago alone and only \$1,954,000 worth recovered. A balance of \$657,000 in favor of the car thieves. The year before the balance was even more, \$846,000.

**I**T might help some to reduce the number of car thefts if owners would be more careful in using their locks. Dealers could help in this way by preaching, if you want to call it that, the doctrine of an ounce of prevention. It doesn't do any good to lock the stable door after the horse is stolen, nor is it possible to lock the car after it is stolen. But both can be locked before these calamities descend.

## For More Complete Tractor Tests

**A** REVIEW of the tractor demonstrations held so far this year proves that meetings of the Wichita and Aberdeen brand are not favored by the farmer. What the farmer buyer really is interested in is comparative test data like that supplied by the Agricultural Engineering Department of Ohio State University from the four demonstrations which it recently conducted in different sections of Ohio.

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**T**O put across the Ohio demonstrations successfully, the state university conducted a definite publicity campaign announcing that the results of these tests would be made public after the completion of the last meeting on the schedule. Their plans were very effective,

as it is estimated that the total attendance at the four places was between 25,000 and 30,000.

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**A** VARIED assortment of soil and terrain conditions with different kinds of footings were encountered by the tractors that took part in the demonstrations and the farmer had the opportunity of observing just what tractors would do under normal farming conditions and how they would compare with each other in a serious test of this kind.

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**T**O those contemplating a demonstration which really means something, the Ohio demonstrations hold a good lesson, as this series of demonstrations has given more information regarding the performance of tractors under actual working conditions than all the other demonstrations held so far this year combined.

## Persistence Will Win

**T**HE transcontinental Motor Transport Corps train is having anything but a joyride in its good-roads propaganda trip across the country. The sands and dreariness of the Great Salt Lake desert were conquered only with tremendous difficulties. Penetrating dust and extreme heat, through a country that has had no rain for more than four months, over a deplorable desert trail, had to be encountered and overcome, for they were encountered and overcome.

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**B**UT the truck train has persisted. Through alkali dust and fine sand, 2 ft. deep on the level, with numerous hidden holes, no material except sagebrush with which to make wheel paths, the personnel of the train

was kept busy jacking up and digging out vehicles sunk into the sand. But they persisted. And thereby hangs the tale.

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**I**T is persistence that eventually will win for this country the good roads she needs. It is persistence that will make up for the past when the shop-worn idea of letting well enough alone applied to roads as to other things. The good roads data compiled on this Army trip will more than make up for any hardships, and the activities as a result of this data can overbalance the lack of road progress in the past. Persistence is winning a path for the truck train across the country and persistence will make of that path in time a hard-surfaced road.



# Thrills Mark Frontenac Victory Labor Day

## Gaston Chevrolet Takes Classic at 93.5 M.P.H.—Milton's Car Burns with Laurels in Sight

UNIONTOWN, Pa., Sept. 1—Cashing in on Tommy Milton's misfortune, Joe Boyer drove Gaston Chevrolet's Frontenac to victory this afternoon in the 225-mile autumn classic at Uniontown speedway. Driving for an easy second place, Boyer advanced to first place in the 190th lap and crossed the tape while the gaze of the crowd still was centered on the fire which destroyed Milton's car and his chance for the purse.

The Chevrolet-Boyer Frontenac made the 225 miles with one stop in 2:24:19.68, at an average speed of 93.5 m.p.h. Victory was snatched from the grasp of Milton, prime favorite, when his car caught fire in the death curve in the 190th lap. Milton was leading the field by three laps when his Duesenberg which took him to victory in three major races this season burst into flames as he was straightening out on the home stretch after having negotiated death curve. Within a few seconds what had been the day's winning car was a charred wreck. Before the crowd had returned their attention to the race Roscoe Sarles, driving Ira Vail's Philbrin, had got the checkered flag for second place with a time of 2:25:51.18, and a minute behind him came Louis Chevrolet in a Frontenac for third money in 2:26:58.81.

Ralph Mulford took fourth place with his own Frontenac, Dave Lewis fifth in a Meteor, Art Kline sixth in a Peugeot, T. N. Nicholson seventh in a Hudson and Wilmer Monahan eighth in a Duesenberg. Sarles, Mulford and Monahan drove a non-stop race. An addition of \$5,000 by Goodyear made the autumn classic a \$19,000 race, the speedway putting up a purse of \$14,000 for the first eight. The Goodyear purse was divided among the first three, all having worn Goodyear tires.

### Winner Got \$7,500

The winning Frontenac took down a combined purse of \$7,500, second got \$4,500, and Louis Chevrolet made \$2,500. The next purse, of \$1,500 went to Ralph Mulford and from there the money went down to \$250 for Monahan. Lewis got an additional \$1,000 for finishing on Mason tires.

Never in the history of the local speedway has a crowd approached in size that which attended the Labor Day races. By reason of his qualifying speed of 105 m.p.h., Ralph Mulford got the pole at the start with Joe Boyer beside him. Boyer took the lead for the first fifteen laps, but soon dropped behind and in successive laps was passed by Mulford, Milton and the two Chevrolets. He continued lagging behind until the thirty-ninth lap, when he went into the pits and continued to the garages after working with his Frontenac for a half hour. Returning to the pits, he relieved Gaston

Chevrolet when the latter came in on the 118th lap for new tires, the only stop made by the machine.

Despite the length of the race the winning cars early showed their mettle, and after the first twenty-five laps the interest of the crowd centered on Milton, the Chevrolets, and Mulford. It was not until the fire, which put Milton into the hospital, that Sarles had attracted general interest.

One of the most remarkable features of the day's race was the comparatively few pit stops. Three cars went through without a stop. One trip to the pits was made by Milton, Gaston Chevrolet and Louis Chevrolet. Art Kline had the most pit stops among the money cars. His Peugeot went into the pits six times with a right rear down. He made his first stop in the thirteenth lap.

Kline owes his finishing position to the

### Order of Finish

Driver	Car	Time	M.P.H.
G. Chevrolet	Frontenac	2:24:19.68	93.5
Vail	Philbrin	2:25:51.18	92.7
L. Chevrolet	Frontenac	2:26:58.81	91.9
Mulford	Frontenac	2:28:54.98	90.8
Lewis	Meteor	2:31:29.27	89.2
Kline	Peugeot	2:34:43.92	87.3
Nicholson	Hudson	2:35:31.86	86.8
Monahan	Duesenberg	2:37:07.68	85.9

efficient work of his pit men. Milton's pit men made a 25-sec. tire change in the 124th lap. Boyer blew a tire on death curve in the 184th lap and was unable to bring his car to a halt before the pits, being forced to drive the bowl on a flat tire. He made the round with apparently undiminished speed and got into the race with a new shoe without having lost second place, which he was holding. Five stops were made by Lewis, each time for a new tire but, like Kline, his pit men worked fast and he was able to retain his position in the first division. Lewis came in in the 133d, 152d, 170th and 189th, each stop being made to change the tire on the same wheel.

Milton's handling of the blazing car was the headiest piece of driving ever seen on the Uniontown track. The machine heaved around, deflecting a portion of the flames to the side while Milton was jockeying the mount toward the lower guard rail. Although workmen had spent weeks in examining every inch of the course, replacing many worn planks with new timber, the heavy grind developed several weak spots, at least one of which presented real danger. That spot showed up in death curve just over the tunnel.

The race started at a speed of 95.5 m.p.h. for the first eight laps, holding that for twenty-five laps, when the average was advanced to 103 m.p.h., later advancing to 104 m.p.h. in the fortieth, the peak of the race. Both entries of Duesenberg were last evening wrecks in the speedway garages. Milton's teammate, Jimmy Murphy, who was to have driven his maiden race yesterday, was wrecked on the death curve while qualifying in the morning. The tail of the Duesenberg was amputated, the steering wheel bent and both Murphy and his mechanic sustained minor injuries.

### Would Check Thefts

WASHINGTON, Aug. 29—A bill to establish a vehicle registration bureau in the Department of Justice as a central registration bureau of licenses for all motor vehicles or conveyances used for travel by air, land or water has been introduced in Congress by Representative R. F. McKiniry of New York. The object is to lend assistance in decreasing the number of thefts.

The bureau would get from all the states registration number and descriptions of car, airplanes, seaplanes, dirigible balloons and other motor vehicles and conveyances of every nature. Also makers would furnish descriptions of the vehicles made or sold by them and, on request, the bureau will furnish proper information to the states as to licenses issued in any other state, together with descriptions.

The bill would appropriate \$100,000 from the Treasury funds for support of this work. The bureau would receive and file reports from all police departments and from any citizen regarding thefts and on request would furnish such information within a reasonable time to any police department or the licensing authorities of the several states.

### U. S. FINISHES FIRST IN AIR

New York, Aug. 10—First, second and third honors in the International Air Derby between New York and Toronto have been awarded to United States pilots of the De Havilland planes equipped with Liberty engines. The winners are: Lieut. B. W. Maynard, 476 1/2 min.; Lieut. Dan Gish, 503 1/4 min.; and Sergt. A. B. Coombs, 511 min. A definite decision as to the winner of the handicap events awaits a new set of time limit lists from Toronto. Three prizes were offered for the speed contest, \$1,500, \$900 and \$600, while first prize in the handicap is \$2,500 and there are eight additional prizes.



# Record Crowd Views Des Moines Show

## Interest in Truck Exhibits One of Outstanding Features of Fair Crowd

**D**ES MOINES, Iowa, Aug. 29—Des Moines' annual early fall show, held in connection with the Iowa state fair during the last ten days, has drawn the biggest crowd any motor show ever attracted in Iowa. As the show is entirely free to the public, it was impossible to get any accurate attendance figures, but C. G. Van Vliet, manager, estimates that at least 250,000 saw it. The fair this year broke all records for attendance and about two out of every three who attended the fair saw the show.

The show was handled directly under the auspices of the state fair association with a very close co-operation from the Des Moines Auto Dealers association and the Des Moines Motor Truck Dealers association. C. G. Van Vliet, one of the managers of the winter show was in charge and was assisted in the management by Don Chamberlain, secretary of the truck dealers' association.

### Cost to Dealer Low

The show was held in Machinery hall, a steel and brick building with concrete floor which made a good place for a business show, although it did not lend itself any too well to decoration. Three fifths of Machinery hall was used for the show. Each exhibitor's space was 600 sq. ft. and, as the booth rental was on a basis of 10 cents per square foot, the dealers feel that they got action at a low expense.

There were forty-three car lines exhibited with seventy-eight cars on display. The truck exhibit almost equaled the showing of cars, with thirty-eight lines and sixty-six models. Nineteen exhibits of automotive equipment were shown. In Machinery hall five tractors were on display, but most of the tractor dealers had their exhibits in the open air. The number of tractors shown was the largest in the history of the fair, and attracted more interest than ever.

Several dealers pronounced it the best show, from a business standpoint, they ever spent money on. The Iowa fair is a farmers' fair and Iowa is characteristically an agricultural state. Most Des Moines dealers are distributors and the fair show gave them a chance to get directly in touch with the farmer. The Iowa farmer comes to the state fair every year to see things and to ask questions. He gave the dealers and distributors a run for their money when it came to questions. Without doubt the show's biggest value was its educational advantage. The winter show attracts the dealers, but here was a show which brought in thousands of farmers every day, and in Iowa the farmer is the biggest market not only for cars but for trucks.

The show itself spent very little money for advertising. Individual dealers used the daily papers consistently for a week

prior and during the show, but the motor show used only a small amount of space in the general advertising done daily for the fair. Machinery hall occupies a position directly in front of the street car entrance to the fairgrounds, and the main walk from the entrance leads directly to the building. Large signs were placed at the entrances, and these were sufficient to bring all the show could handle. In Iowa the fairgoers like to get an early start and, along with rest of the exhibitors, the motor car men were on the job at 7 in the morning and kept at it until 8 in the evening.

From what was said about the educational advantage of the show it must not be thought that it was lacking in actual sales. A majority of the dealers showing are up against the car shortage handicap, but there were many actual sales made during the fair. As an evidence the Briscoe dealers sold all three cars in their booth and the purchasers tried to secure delivery before the close of the fair but the managers refused to allow any cars removed from the building before Friday noon. Truck dealers were also making sales.

But little effort was made to decorate the building although some exhibitors made their spaces very presentable by use of rugs, palms and easy chairs.

Probably the most outstanding feature about the fair show was the great interest shown in trucks. The Iowa farmer is ready to buy trucks. In fact, there is a question if he is not better

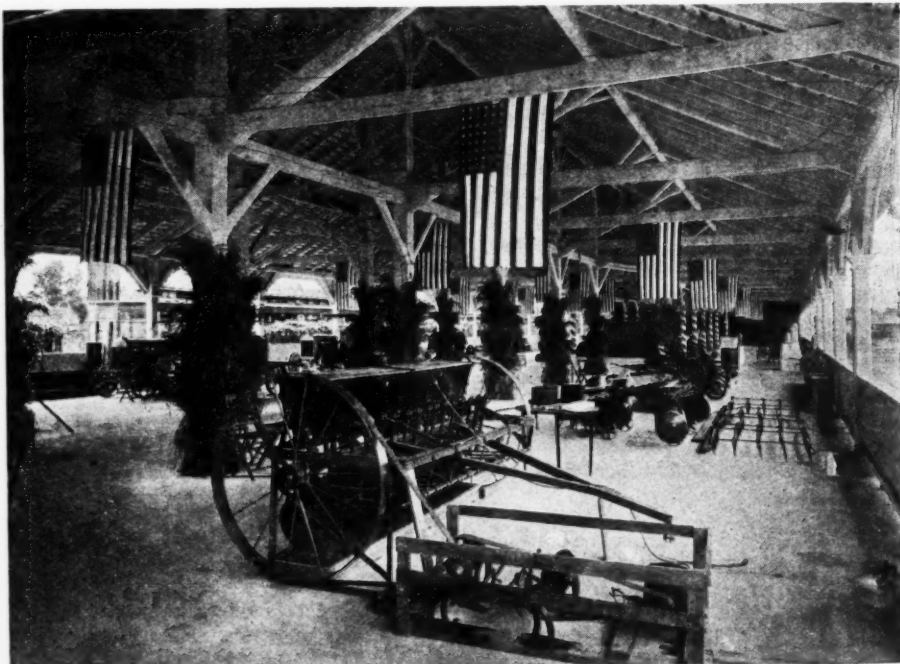
sold right now on trucks than the average dealer. For, speaking in general terms, there is many an Iowa dealer who has had to be knocked on the head three or four times to realize that the truck is really the thing.

The recent National Motor Truck Development Tour is without doubt one factor in the interest in trucks manifested at the fair. When the trucks went right into the Iowa fields and showed the farmer what they could do for him they sold him on the truck proposition. Another big factor which is going to mean much to the truck salesmen is the fact that the Iowa boys who have and are coming back from military service are demanding trucks. Iowa sent 110,000 boys into the military service and these lads are going to be some little missionary army for the truck and tractor dealers.

### Truck Market There

And when it comes to being the market for trucks, Iowa is some market. A. S. Kroh, manager of the National Truck Development Tour, in a recent speech to Des Moines salesmen, told them that Iowa was the greatest potential market in the world for trucks.

Just now the state is rolling in wealth and the Iowa farmer is ready to buy anything which it can be shown will help him produce greater crops. Iowa is just finishing one of the best small grain harvests the state has ever known and ordinarily during harvest time the Iowa banks are calling on their Chicago correspondents for funds with which to finance crop movements. This year the situation is all changed and instead of borrowing money the farmers and banks are sending it into Chicago. As an evidence of the state's prosperity in a single day recently one Chicago bank received de-



All kinds of farm equipment for use with a tractor were shown in the Herring exhibit

posits of \$39,000,000 of which two-thirds was from Iowa banks. One Des Moines bank alone, on this day sent \$1,000,000 to its Chicago correspondent.

The truck dealers are waking up to this potential market as is shown by the fact that several models at the fair show, are equipped with bodies primarily useful to the farmers. One sale during the fair was by the Iowa White Co. of a \$3,800 job. An Iowa-made truck never before shown in Des Moines attracted considerable attention at the fair show. It is the Bell, made by the Iowa Motor Truck Co., Ottumwa. The model shown at the fair was sold to the Morrell Packing Co. and is to be shipped to New York.

The truck dealers as well as the car men are up against the shortage bogey, and several of the trucks on display were sales made previous to the fair which had already been painted with the purchaser's ads.

#### TEXAS WILL GET ROADS!

Austin, Tex., Aug. 29—Texas is undertaking a road-building program unprecedented in magnitude by any such improvement ever undertaken in the state. Since the beginning of the year county and district bond issues have been voted amounting to more than \$70,000,000, and it is probable that before the end of the year this amount will be increased to near the \$100,000,000 mark.

In addition, the people will vote on a road amendment Nov. 4. This amendment proposes the raising of the 15-cent limit for taxing for road and bridge purposes to 30 cents on the \$100 valuation. In addition it proposes that people of any district by a majority vote may levy a special road maintenance tax of as much as 60 cents on the \$100 upon themselves.

## Herring Spreads Gospel of Power Farm

### Stages Individual Tractor Show at Iowa State Fair and Will Repeat

DES MOINES, Iowa, Aug. 29—The gospel of power farming was preached in a very effective way by the Herring Motor Co. during the last ten days to thousands of Iowa farmers who came to Des Moines for the state fair. For the period of the fair Herring took over Power hall and used it for the biggest individual tractor show ever attempted by any central western distributor. While the Herring show was, of course, a Fordson show, it was a big demonstration for power farming in general and was recognized as such by the other tractor dealers with exhibits on the ground.

Several farm implement dealers associated with the Fordson co-operated to make the show a big success by building specially finished implements for the show. Probably the most talked-about exhibit of the entire Iowa state fair was the central platform in the Herring show. The platform was covered with green sod, and in the center was a silver-finished Fordson on a revolving platform. On the sod, at each side of the Fordson, were an Amsco drill, a Dunham Cut-packer, an Oliver plow and a Roderick disk. All these implements were made up specially for the fair show, and in point of finish they were quite the finest thing the Iowa farmer has ever seen. They were all done in silver, enamel and gold leaf.

Another feature of the Herring show was the moving picture auditorium. One end of power hall was fitted up to seat 600 persons and here from 7 o'clock

in the morning until 8 at night the story of power farming was told in pictures. The new Fordson movie "Keep the Boy on the Farm" was given its first showing and told in a very direct way just what the tractor and its associated farm equipment meant in the everyday life of the Jones family. The auditorium was crowded even during the racing program.

In another end of Power hall belt-driven equipment was shown in action. Among the implements shown were spreaders, separators, ensilage cutters, bailers and feed mills.

At the close of the Iowa state fair Herring will take the same exhibit to the Nebraska state fair and Lincoln and in the following week will make the South Dakota state fair at Huron. Iowa, Nebraska and South Dakota are in the Herring territory.

#### RURAL EXPRESS EXHIBIT AT FAIR

New York, Aug. 29—The rural motor express idea is to be given publicity by the state at the fair at Syracuse the week of Sept. 8. A rural motor express exhibit will be included in the display of the bureau of Farms & Markets. It will include charts, literature and vehicles, and speakers will talk every day in favor of the idea.

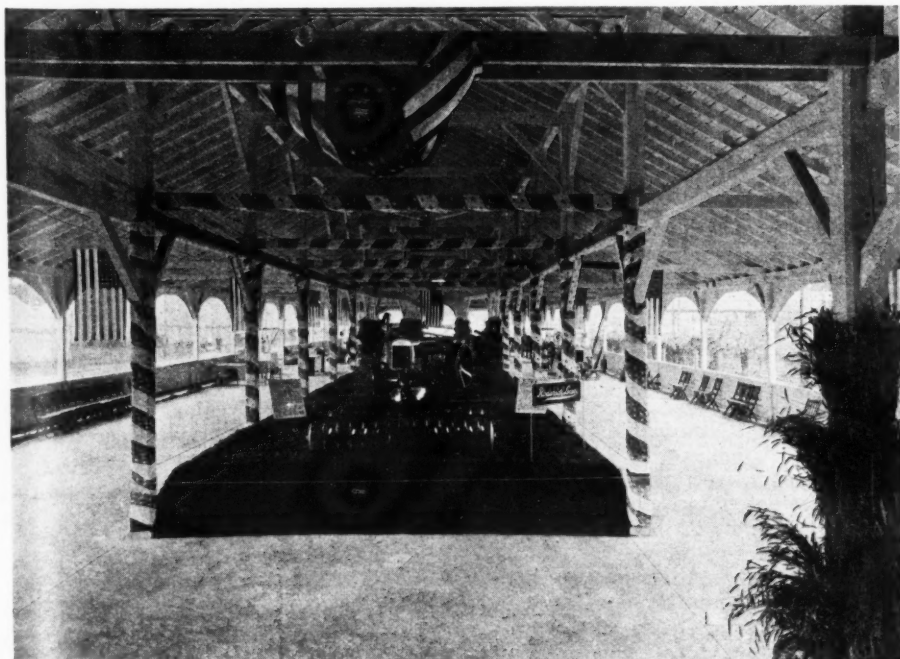
Manager F. W. Fenn, of the Motor Truck Committee of the N. A. C. C., is promoting truck tours from Buffalo and Rochester to the state fair. Only ten makes of trucks will be entered in these tours, and they will be exhibited, loaded with farm merchandise, at the fairgrounds. It is estimated that from 75,000 to 100,000 will see the exhibit at the fair, while another 200,000 will see the caravan enroute to the fairgrounds. The caravan will stop for meetings at various points.

Governor Smith has appointed a new highway transport committee, of which Fenn is a member, and work is to be actively carried on. The other members of the committee are: Peter G. TenEyck, chairman; Frederick S. Green, state commissioner of highways; Professor James E. Boyle, Cornell university; William E. Danner, chairman of the Commission of Farm and Markets.

#### COLUMBUS SHOW A SUCCESS

Columbus, Ohio, Aug. 29—The fall show of the Columbus Auto Show Co., which was held in conjunction with the annual Ohio state fair Aug. 25-29, was a success. Business was rather better than at the usual winter or spring show.

Twenty-four dealers showed thirty-six different lines of cars. Eight truck and tractor dealers showed eleven



The central, sod-covered platform with the special silver and gold farm implements exhibited by Herring



trucks and tractors. This exhibit did not include all the tractors shown, as many were displayed at other places on the grounds, generally with implement exhibits.

The crowds were much larger than ever before, due to the fine weather and the fact that farmers and rural residents generally were more than usually interested.

Dealers report marked interest among the farmers in motor cars of all kinds. Crops have been unusually large this year and with high prices prevailing the farmer is going into the purchase of cars much more heavily than usual. One of the dealers sold ten cars the first day of the exhibit and has been averaging about eight every day since. Others sold from three to five daily and have picked up many prospects.

#### INDIANAPOLIS SHOW SET

Indianapolis, Ind., Aug. 29—The show of the Indianapolis dealers will be held in the new Manufacturers' building erected by the state for all sorts of industrial exhibits but primarily for the annual show which has grown to be one of the big features of the state fair. The dates are Sept. 1-6. The building has 85,000 sq. ft. of space, all of which has been taken.

The state fair will have a display of tractors and power farming machinery.

#### OHIO ANNUAL, DECEMBER 3-5

Columbus, Ohio, Aug. 29—Arrangements are being made by Victor Moon, secretary and manager of the Ohio Automobile Trade Association, for the annual convention, scheduled to be held at Cleveland December 3-5. Speakers for the meeting are now being arranged for and the local committee on entertainment has been busy. A. E. Mitzel of Canton is president, with two terms to his credit. Andrew Auble of Akron is first vice-president and F. J. Girard of Columbus, second vice-president. Many important matters will be up for discussion at the annual meeting.

#### PLANS FOR M. A. D. SHOW

Milwaukee, Wis., Sept. 1—Milwaukee's annual fall show, conducted in connection with the Wisconsin state fair by the Milwaukee Automobile Dealers, Inc., is expected to be this year the most attractive and interesting of any of the four shows of this character which the association has given. With factories filling much more than half of the actual demand for cars, an eager public is coming out in full force to see what the new season offers by sample, as it were.

The state fair and the show open Sept. 13. The fairgrounds are about 6 miles from the heart of the city, at West Allis, the manufacturing suburb of Milwaukee. The show is housed in a large fireproof building, leased from the state fair management, or state department of agriculture, by the Milwaukee dealers at a lump rental for the week. The associa-

tion attends to all the details of selling space, installing decorations, etc. An admission fee of 10 cents is charged, this nominal fee having been found advantageous in keeping the crowds duly limited.

In addition to the hall, a concrete building, 150 by 350 ft., a circus tent will be used as an annex to handle exhibits. This has been done at the previous two fairs, but before the 1920 exposition the permanent structure will be double in size. This work was delayed by the war and other conditions. This year the permanent building will be devoted to exhibits of cars and automotive equipment, and the tent will contain the truck and trailer displays.

Special stress will be laid upon the commercial vehicle at this year's state fair show. A truck transport demonstration has been arranged. Originally this was planned as a three-day cross-country tour through central Wisconsin, winding up its route at the state fair park in the middle of the week. Because of the lack of time, this feature has been reduced to some extent and will take the form of a parade of trucks, both new and in user's hands, along the downtown streets of Milwaukee, thence to the fairgrounds over concrete boulevards all the way, around the circular mile dirt track, past the grand stand, where the procession will be in review before Gov. E. L. Philipp and other notables.

There will be a loaded and unloaded section, the whole being designed as a ship-by-truck promotion, industrially as well as agriculturally. It is hoped to have not less than 500 trucks in line.

#### WINTER SHOW NOT FAVORED

New Orleans, La., Aug. 29—It seems probable that there will be no fall or winter show in New Orleans. The dealers appear to be almost unanimous on the idea that it is better to have a big spring show than a fall or winter exhibition. Some of the used car dealers are in favor of a fall show, and it is barely possible they will yet get together and pull one off, but the dealers in new cars probably will wait until spring and put on an even larger show than was held here last April, when some \$150,000 worth of cars were sold from the floor and almost as many outside from prospects sighted at the show.

Many dealers are advocating a truck and tractor show, or, rather a series of shows and demonstrations, to be held, if possible, under the auspices of the Louisiana-Mississippi Automotive Trades Association, through the towns of the farming sections of Louisiana and Mississippi. According to dealers from the interior of both states, the truck and tractor show, or the big demonstration, would accomplish little. What the southern farmers need to make them tractor users and buyers, according to these dealers, are permanent demonstration points in the places of business of the tractor dealers

in the smaller towns, where the farmer can go at any time, to see a demonstration of the tractor, or to which he can be attracted by demonstration at stated intervals.

#### PARISH SELLS \$2,000,000 ROAD BONDS

Alexandria, La., Aug. 29—The Rapides Parish police jury has sold the \$2,000,000 bonds recently authorized for good roads in that parish, and road improvement will be commenced about Sept. 15 and the bond issue provides sufficient funds to connect the present road system of the parish with roads leading in all directions through Louisiana. In connection with the road work to be done, sixty business men of Alexandria made a trip by car to Oakdale and other surrounding towns to learn just what roads need improvement and where new highways will have to be constructed. The trip was under the auspices of the Alexandria chamber of commerce.

#### MISSISSIPPI PROVES ROAD INTEREST

Jackson, Miss., Aug. 29—The campaign for good roads in Mississippi which has been tremendously advanced by the organization of 'dealers into the Louisiana-Mississippi Automotive Trades Association, is pressing steadily forward. In September the voters of Warren county will pass on a bond issue of \$500,000 to be used in the construction of new highways, and Hinds county is issuing bonds for \$125,000, in addition to about \$500,000 already issued for the same purpose. Since the first of January not a bond issue proposed for good roads in any county in Mississippi has been rejected by the voters. The state highway commission is deluged with requests for plans for road improvement from counties, towns and private individuals, but the clerical force is so inadequate that the board has been unable to meet half of the requests.

#### SAN ANTONIO ACCIDENTS DROP

San Antonio, Tex., Aug. 29—A phenomenal decrease in the number of motor car accidents is shown by police records in San Antonio for the first three weeks of August. During the twenty-one days only forty-one accidents are reported. Speeding continues to dominate among the offenses. For the same period forty-nine arrests were made for speeding. This figure also shows a considerable decrease in this offense as compared with the records of even one month ago.

The first week of August shows the largest number of accidents of any week during the month. There were a total of nineteen, according to the police records. Speeding cases ran slightly over this number when twenty-one were reported. Only twelve accidents are reported for the second week with fourteen cases of speeding.





This attractive building housed the cars and some of the equipment for Toronto. Trucks were shown in hangars to the rear, while tractors, airplanes and other automotive exhibits are scattered through other buildings and tents

## H. R. H. Opens Canadian National Motor Show

### First Post-War Exhibition in Dominion Launched by Prince of Wales

**T**ORONTO, Aug. 29—Canada's only national motor show was opened here in conjunction with the Canadian National Exhibition this week by the Prince of Wales.

Forty car manufacturers, twenty-nine truck manufacturers, upward of 100 automotive equipment manufacturers and many tractor, airplane, motor boat and motorcycle manufacturers are represented. Owing to the far from adequate space, many have been disappointed. Many strictly automotive exhibitors are scattered through the buildings that make up exhibition city. Applications far in excess of space available in the Transportation building and the five annex hangars were received four months ago.

#### Space Too Cramped

Many of the exhibitors are wrathful over the fact that at most they can show but three or four models, and it is freely predicted that the Automotive Industries of Canada—the N. A. C. C. of the Dominion—will withdraw not only their designation "Only Canadian National Motor Show" but also their sanction and support from the event unless the much-heralded Automotive palace with quadruple or quintuple the accommodation afforded by the Transportation building is constructed before another year rolls by.

As this is the first post-war national motor show and the first collective showing of post-war, new-season models and as no other country holds its various national automotive exhibits concurrently and at the same place, the Canadian National exhibition events attract attendance from practically every country.

Owing to transportation and labor difficulties, not one of the British, French, or Italian car manufacturers have been able to get cars here in time for the show. Wolseley, the first of these to reserve space, does not now expect to place models on the Canadian market before next spring and Fiat, the last of European manufacturers to make application, may not now be in a position to deliver cars here before late fall or early winter.

Car and truck sales continue as brisk as production permits, demand far outreaching supply. Most showrooms are denuded of cars and have been for months.

Manufacturers, distributors and dealers individually and in their conventions declare that fall and winter sales will be on an unprecedented high level, that the car famine conditions cannot be more than slightly alleviated for a year and a half and not reduced to normality within from two to three years.

Canada is the last great west, with most of the world's nickel, the largest silver mines, gold mines and yet her mineral resources are scarcely scratched. As much can be said for her forests and fisheries. Canada is at the inception of an era of development not equalled even by the United States following the Civil War. With an area larger than the United States and Alaska combined, Canada has hydro-electric power available to run the industries and railroads of the continent, has 300,000,000 acres of untitled clearable land, the best wheatgrowing land in the world and the last great stretch of fertile uncultivated land under stable

government. Canada has no bad lands or desert wastes.

The per capita wealth of Canada today is the highest in the world—high enough to offset the 60 odd per cent Canadians must pay for cars above the U. S. market price. That combined with the economical need for cars in the Dominion, is the reason given by some of our most astute manufacturers, dealers and distributors for believing that per capita Canada will yet equal the United States in being automobilized.

It is predicted that more than 800,000 will attend the National motor show during the next two weeks. Last year more than 600,000 passed through the Transportation building.

#### DETAILS OF LINCOLN SOON

Detroit, Aug. 29—Details of the car to be manufactured by the Lincoln Motors Co. will be given out within ten days, it is rumored here, although officials of that company are withholding this information and set no time as to when the announcement will be made. Recently a general sales manager and purchasing agent were engaged to begin their work Sept. 1, and it is known the employment department has been combing the city for expert machinists. During the summer machinery and tools have been installed in the Lincoln plant, and gradually the factory organization is being perfected.

The new car, it is reported, will have an eight-cylinder V-type engine and weigh about 3200 lb. The price will be around \$2,500, it is said.



This shows the old building which for a generation was enough for Deisher & Kronquest, old-time implement dealers. On another page is shown the present up-to-date building that motor car trade effected

## On the Firing Line in Nebraska

Here Also Investigation Shows Motor Car Dealer Dominating Tractor Field

**H**OLDREGE, Neb., Aug. 15—It's pretty much the same thing everywhere one goes—the motor car interests dominate in the tractor field. This place is no exception to the rule. And what the situation is here is particularly significant, because of the exceptionally successful tractor demonstration which was

By Fred M. Loomis  
*Motor Age Editorial Staff*

pulled off here recently. It was distinctly a dealer show. Practically every tractor represented was there, because it was handled by some dealer in the neighborhood, and what few had no nearby dealer

representation got no nearer the factory than the distributor at Lincoln, which is the tractor center for the South Platte territory in Nebraska.

Six dealers are handling tractors in Holdrege. Four of these are motor car dealers, and two are implement dealers, although as both of the latter concerns handle trucks also they will qualify as automotive dealers.

C. S. Prime handles the Ford and Fordson. He has delivered forty-one tractors to date and says he could dispose of fifty more this season if only he could get them.

The Holdrege Buick Co. sells the Cletrac.

The Kingsbury-Kiplinger Motor Co., handling the Dodge Brothers line, sells the Case tractor.

A. F. Larsen, with the Dort and Studebaker cars, sells the Frick tractor.

Deisher & Kronquest, implement dealers, sell the Titan and OilPull.



Above—The Willys-Overland representative at Holdrege is one of the dealers at that place who do not handle tractors

Right—This is the Maxwell representative's place of business at Holdrege. As the signs indicate, no tractors are handled here as yet





The Farmers' Union Exchange, implements, sells the Parrett and the Waterloo Boy.

Deisher & Kronquest sell International trucks, while the Farmers' sells the Reo.

Probably the principal factor in the local tractor situation is the Kingsbury-Kiplinger Co. This concern was early in the tractor business in this vicinity, which really only got a good start with the first demonstration held last year, and probably there are more Case tractors in the vicinity of Holdrege than of any other make. The company runs the tractor business as a department separate from its motor car business, has special tractor men and special tractor service men and goes after business aggressively. Incidentally, too, the company is selling grain separators and all the other power equipment which naturally goes with the tractor.

With the exception of the Fordson, already mentioned, the other motor car dealers here have not done so very much with the tractor up to the present time, as they have not specifically departmentized the business and have not given it the attention it deserves. The impetus given to the tractor by the recent demonstration however, will inspire them to greater efforts, and if they do not vastly increase their relative importance in the local trade during the coming year, it will be their own fault. Certainly the opportunity is here.

#### Implements and Cars

The case of Deisher & Kronquest is an instance of the effect the motor car business has had on the old-time implement house. In the illustrations herewith is shown the old building which for a generation sufficed the company for its implement business. Accompanying it is the present building utilized by the company for an office and salesroom. This building was built to accommodate the motor car trade, for until last winter the firm sold motor cars as well as implements. During the epidemic last winter, Nels Kronquest, the then surviving member of the firm died, and the present management discontinued the motor car department and since has devoted its

energies entirely to the implement, truck and tractor business. It hardly is likely, however, that so fine an equipment for motor cars long will be permitted to harbor cream separators and washing machines, but that a line of cars will be taken on again.

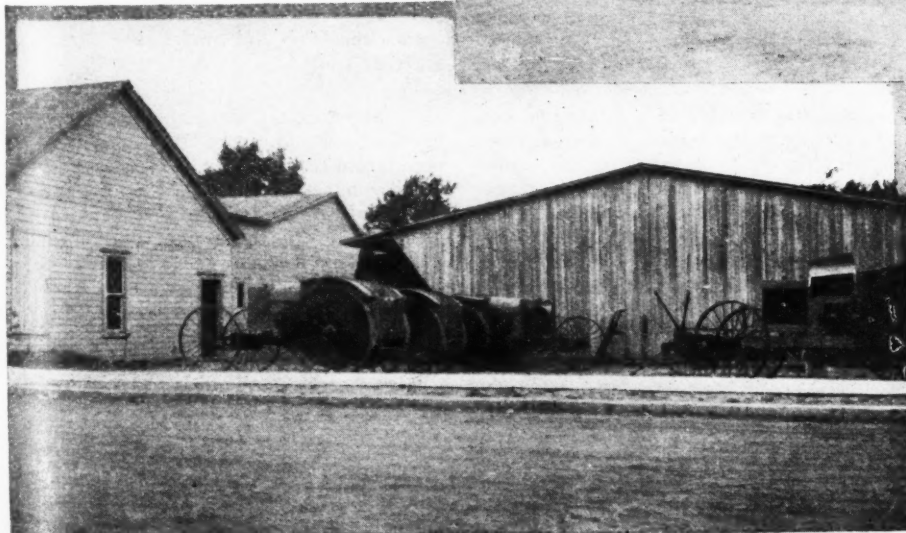
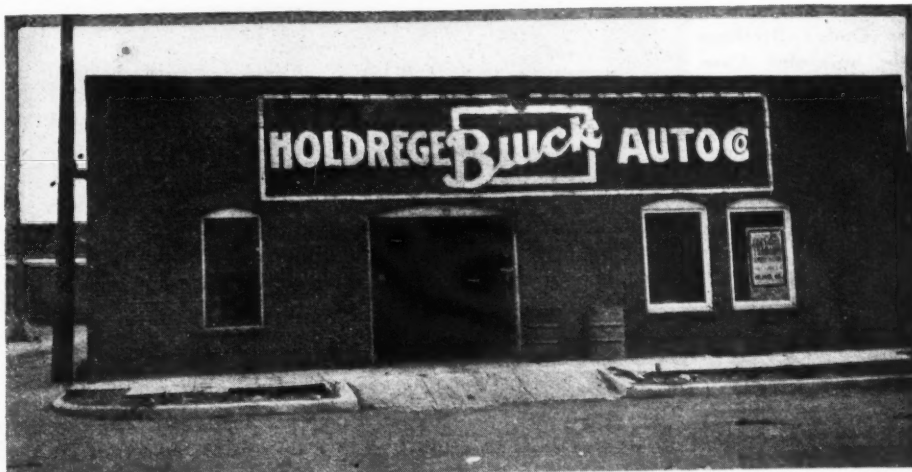
Next to the Dodge dealers the most aggressive concern in the tractor business at present in Holdrege is the Farmers' Exchange Union. This concern is of a type not commonly found in the implement business, as it is co-operative and all of its business is done on a strictly cash basis.

During the last twelve months the company has sold nine Parrett tractors and fourteen Waterloo Boy. It is looking for at least a duplication of this business before the close of the present season. Emil B. Hassel, the manager, says he

has "Fixed more machines with the oil can than he ever fixed with a monkey wrench."

Hassel says the whole trouble with the implement business is the excessive amount of service which has to be given because of the ignorance or carelessness of machinery owners. He is full of the trials of the tractor service man. As typical instances of what the dealer selling tractors must stand for in the way of excess service, which, according to the implement code, must be rendered free, he mentioned the following:

A farmer 'phoned in the second day after he had had his tractor delivered to him that he could not start it and there certainly was something radically wrong with it. Not being able to get an inkling of what might be the trouble over the 'phone, a service man was started out.



The Holdrege Buick Co. also sells the Cletrac tractor

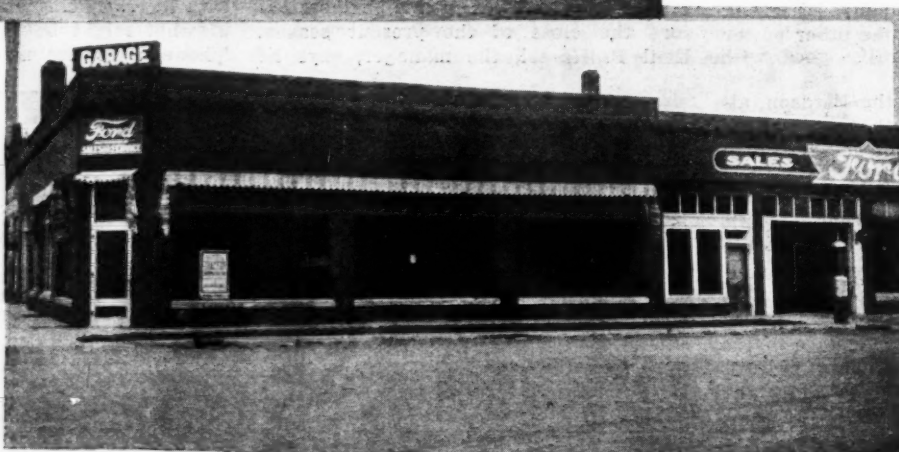
The Farmers' Union Exchange sells the Parrett and Waterloo Boy tractors

Left—This is a view in the rear of the Farmers' Union Exchange, showing some of the Parretts lined up





The Kingsbury-Kiplinger Co. handles the Dodge Brothers line and the Case tractor



C. S. Prime handles the Ford and Fordson at Holdrege and to date has sold forty-one tractors

When he got to the farm he found that just before he arrived the farmers eight-year old boy had succeeded in getting the machine started. It developed that all that was the matter was the farmer had forgotten to trip his impulse starter.

Another farmer blew into the office one day with the magneto of his machine and wanted it adjusted. Sent back to the farm, he promptly burned up the wires saying the tinkering with his magneto had put it out of business effectually and that his tractor refused to start. Just as in the other case, no rational explanation of the trouble could be got over the 'phone, and again a service man went out. He found that the farmer in putting his magneto back on his machine had attached the wires to the wrong posts. When the trouble was explained to him all he gave was a sheepish grin and the statement that he knew better but he got rattled.

Hassel says there is a lot of that, coupled with poor lubrication, to make the life of the tractor dealer anything but a picnic during the season. He says the only solution is careful and complete instruction at the time of delivery. This would be very effective in cutting down the demands for excess service and in reducing the present overhead cost of selling tractors.

Apparently, because he happens to be an implement dealer, it has not occurred to him that making a charge for such services might have a similar effect.

Hassel says the dealer who sells tractors enough to get the quantity discount, provided he can devise some way to re-



This is the garage of A. F. Larson, who sells the Dort and Studebaker cars and Frick tractors

duce the free service to a minimum, can make money in the tractor business. Even so, the most profit is made on the equipment which goes with the tractor, because nearly every tractor sale in the vicinity of Holdrege involves also the sale of a plow, a drill and a lister. There is a good margin of profit on such tools because the selling overhead and service costs are practically nil.

#### Fairmont, Neb.

At Fairmont, Neb., there are at present just two concerns trying to sell tractors, and neither one has accomplished very much, for the reason that there has been very little interest in tractors so far in that vicinity.

George W. Porter, implements, sells the Titan and the Case and has perhaps half a dozen machines out. He says he has not pushed the trade very hard yet because he is not fixed for it. What experience he has had has convinced him that the dealer who would succeed selling tractors must have service equipment and service men, and up to the present time he has neither.

The Brown Auto Co., Buick dealer, has taken on the Samson and has sold two up to this time. There is active inquiry, and if the machines now in the field meet expectations, there will be an active demand in the future.

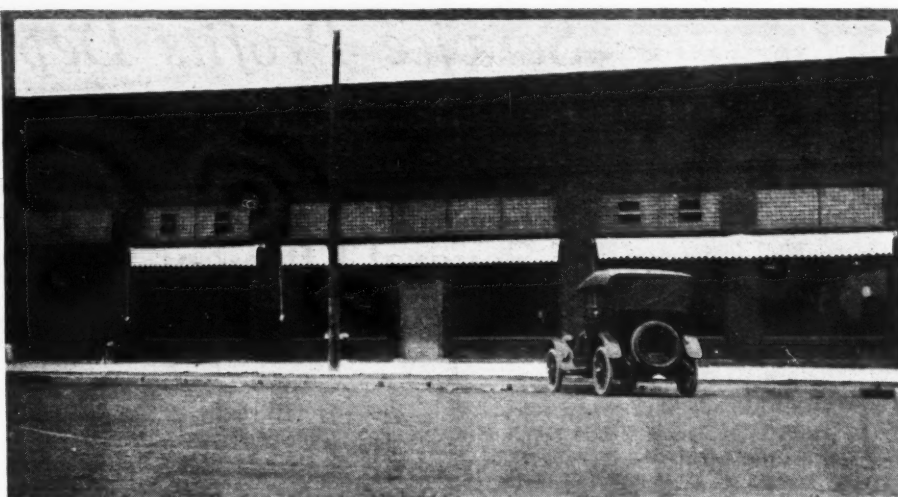
Inquiry among the distributors pres-

ent at the Holdrege demonstration brought out the fact that the tractor population of Nebraska is increasing very rapidly but that there are a good many localities where interest still is latent. It seemed to be the general opinion that the problem in Nebraska was one of getting the right kind of dealer. In this state, too, just as is the case in Kansas, there is a development, especially in the western portion of the state, of the exclusive tractor and power farm equipment dealer. Some of these new companies, particularly some which have been assisted by the services of old time tractor and grain separator traveling men, many of whom are leaving the road and are going into business, are making

a wonderful success this year and are laying the foundation for a still greater success next year. Here, too, the attitude of the local banker is a big factor, and distributors say that where the banker can be sold on the power farming idea, any man who has any pep at all can make good selling tractors and power equipment.

#### PLANS FOR OVERLAND FOUR

Toledo, Ohio, Aug. 29—Willys-Overland will push the sale of the new Overland-4 with a national advertising campaign which, it is said, will be the largest ever staged by that company. Due to the strike, production on the new model was greatly delayed. Finished machines are now coming through, and the company is busy supplying its dealers and distributors with demonstrators. Three of the cars are making the first transcontinental test trip of the United States Motor Transport Corps, which started at Washington July 7 and is expected to arrive Sept. 2 at San Francisco. The company already has held one distributors' meeting at which details regarding the marketing of the new car were taken up. Another such meeting was planned to be held at factory, at which complete details for the public announcement of the Overland 4 will be given



Here is the present building of Deisher & Kronquest, who sell the Titan and Oil Pull

and all of the sales helps will be outlined to the distributors, so they in turn can tell the dealers about the plan.

By the end of August it is expected every distributor will have three Overland 4 touring cars, one for his showroom, one as a wholesale demonstrator and one as a retail demonstrator. Soon after the company expects to supply each distributor with one coupe, one sedan and a chassis. All these are to

be used for demonstration and display purposes only and are not to be delivered to any one until all dealers are supplied with cars and shipments for retail distribution are received.

By Sept. 15 the company expects to supply every dealer with a sample Overland 4 demonstrator. When all dealers have been supplied with demonstrators the first national announcement of the car will be made.



Here is shown the first wrecked plane to be salvaged in Kansas City and one of the first in the country



# Service Profits Depend On: ROUTING OF JOB

## Diagram of Several Efficient Methods—Application of Progressive Assembly Idea

THE ordinary size of service station is the most prolific waster of space simply because it does not locate the various departments properly, so cars can be routed through the building to take the most advantage of the space available. The larger the building is in floor space and the more specialized the departments become, the easier it is to lay out and route cars economically. However, as the smaller garage is in the majority and is the worst offender, this is the type to be considered.

The capacity of a building is largely dependent upon the width of the building and the aisle location. To illustrate this, suppose we use two buildings of equal floor space of 3000 sq. ft. each. Fig. 1 shows a building 40 ft. wide and 75 ft. long, with one row of cars on one side of the building and the aisle on the other. This, as a comparison with Fig. 2 shows, is a very poor arrangement on account of the wasted space. It is only possible to put nine cars in the 3000 sq. ft.

### Center Aisle Principle

In Fig. 2 is shown a building 60 ft. wide and 50 ft. long, employing the center aisle principle in its construction. The maximum amount of space is utilized in this layout, as it is possible to place twelve cars in the building and still be able to move them in and out without interference with any of the other cars in the building. For a straight storage proposition this proves that the center aisle principle is the best, as it allows the maximum number of cars to be placed in a certain amount of floor space.

It also proves that the best width for a building lies between 60 and 70 ft., depending upon the overall length of car is being handled.

But there are many other things to be considered in the majority of cases, and we cannot adopt an ideal routing plan because most of the smaller buildings are a combination of sales and service. This alters the circumstances materially, as one must allow for space for sales and accessory display, general offices, stockroom, restrooms, etc.

Such a building with a combination of sales and service is shown in Fig. 3. This building is 60 by 150 with a total floor space of 9000 sq. ft. and a capac-

By Harland C. Skinner  
Motor Age Editorial Staff

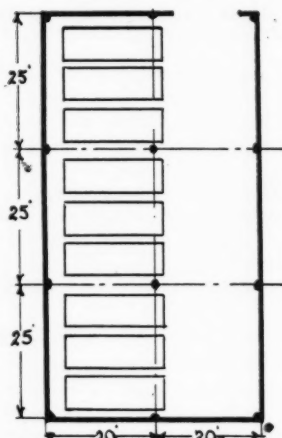


Fig. 1—Poor arrangement in this building of 3000 sq. ft. makes it possible to store only nine cars

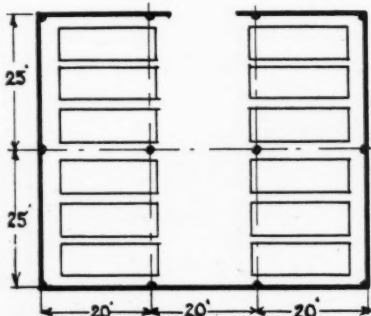


Fig. 2—Showing the advantage of the center aisle principle which makes room for twelve cars with the same floor space as used in Fig. 1

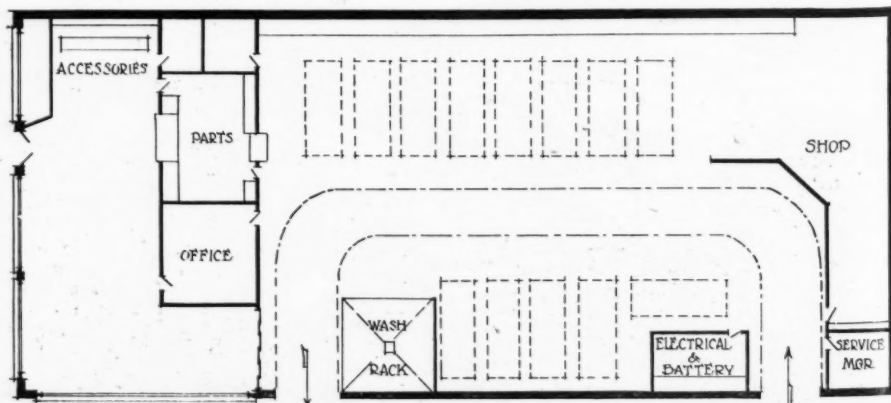


Fig. 3—An average size car sales and service building with a good routing plan

ity of about fifteen cars in the service department. The separate entrance and exit is to obtain the best routing possible under the circumstances and to be able to handle the short-adjustment jobs in a short time. The service manager's office and the battery department both are located near the entrance so a car can have immediate attention when it enters. The driveway between the two doors has sufficient space to take care of four or five cars that need only minor adjustments. All car locations in the shop are such that they can be removed from their stalls without disturbing any of the other cars.

### Getting More Display Space

In this particular layout, by locating the driveway into the sales room on one side of the building instead of the center, it is possible to get one more car into the display room.

Quite frequently companies selling both cars and trucks desire to have their sales and service in separate buildings. A service building for handling two different sizes of vehicles has some points to consider different from those when servicing one type of vehicle. It is best to keep the trucks and cars separate if possible.

Fig. 4 shows a building in which the truck service and car service are handled separately. In this design an overhead mono-rail is used to transport heavy parts from the two shops to a common machine shop. Both shops have easy access to the stockroom, which also has a small portion of it devoted to the storing of accessories.



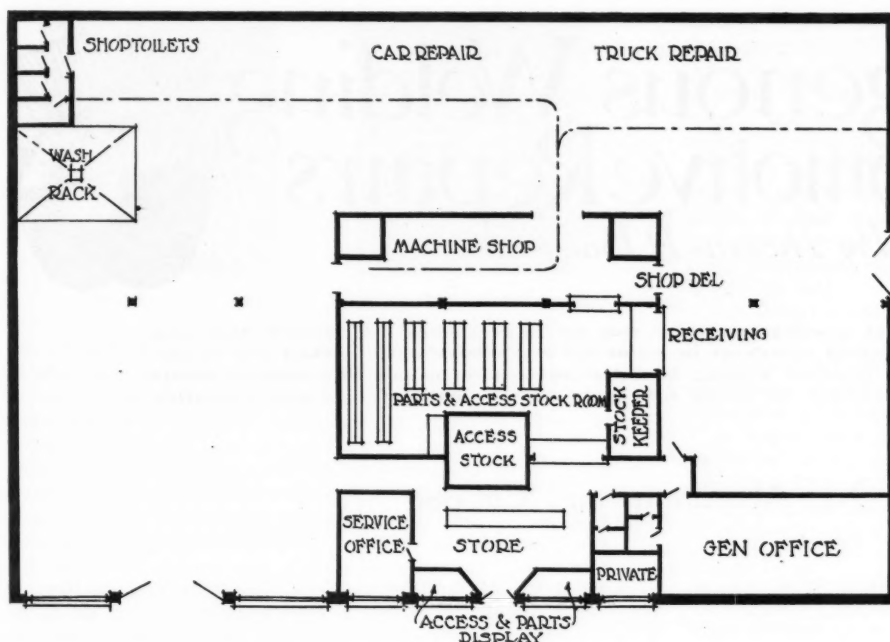


Fig. 4—Combination car and truck service layout with vehicles placed in separate workshops and with a common machine shop

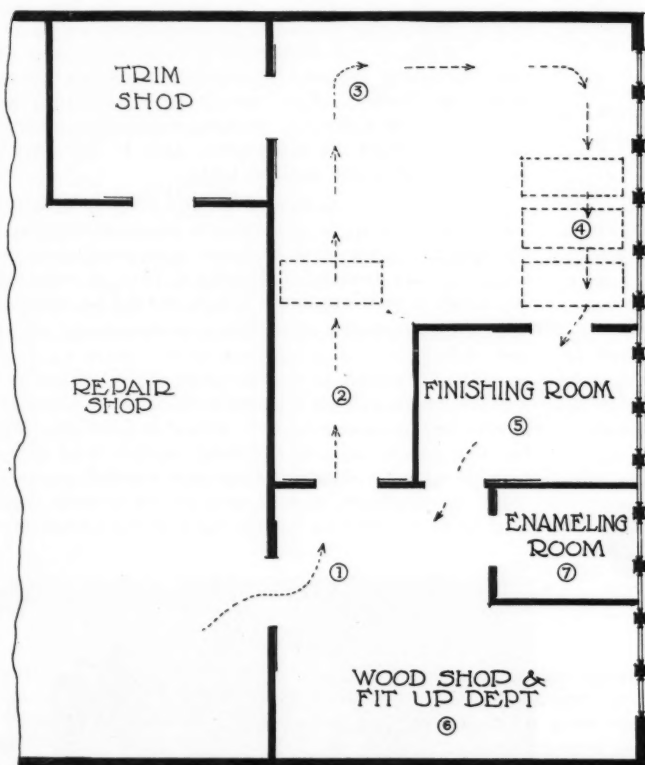


Fig. 5—Good location of departments for progressive routing through coach shop

The car side of the building is made larger than the truck side, as it usually has the bulk of the business. The building is 100 by 150 with a total floor space of 15,000 sq. ft., capable of handling twelve cars and six trucks without being crowded. A car or truck can be moved from any position without disturbing any of the other vehicles in the building.

Both these buildings have a good routing plan, considering the size of

the building and the fact that there are no special departments for doing certain classes of repair work. In large buildings, where it is possible to specialize more, it is much easier to exemplify proper routing and have the car go through the repair process progressively, but as a large building can be used only by the largest distributors and does not apply to the general case, it is best to try and develop a good routing plan for small buildings, where it is easy to get a car in and out without having to move several other cars to do so.

#### Sequence of Operation

It is much easier to apply the progressive routing principle to a small coach shop as shown in Fig. 5 than it is to illustrate it for a small repair shop. This illustration shows the portion of a building in which is located the wood, trim and paint shops. A car entering first is stripped in the wood shop of all enameled parts, such as fenders, bonnet, lamps, radiator, etc. While the car is going through the painting process these parts are being enameled so they are ready to attach when the car leaves the finishing room.

After leaving the wood shop where the car has been stripped, it then is mounted on a chassis dolly with roller caster so it can be moved around easily and follow the prescribed course through the different painting processes.

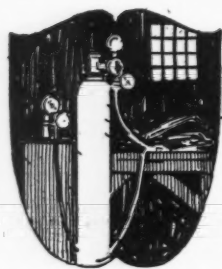
The first operation is to have the old paint removed or burned off and then to move on where the application of the metal primer and ground coats begin. The car moves around the paint shop as illustrated until it receives its final color coat, just before entering the finishing room. Here it either receives a rubber varnish and finish varnish coat or else just one finishing coat, depending upon the class of work that is being done.

#### Final Fitting

When the finishing work is completed, the car then moves out into the wood shop, where it is fitted up and the enameled parts are attached. There may be some criticism of this, due to attaching the enameled parts after the body is finished and the possibility of the body being scratched by the fit up men. But it has been done successfully and saves a great deal of time in final touch-up work, if it can be carried out successfully. Otherwise, if the fit-up gang do not use care in the work, it is best to attach these parts before the car enters the finishing room. However, this is not necessary under careful supervision and has been found a very efficient routing plan and one that saves time and money when properly carried out.

Next week Motor Age will carry an article, well illustrated, on the ideal service station. There also you will find the economic use of space advocated here. In fact, the layout and routing of job must be co-ordinated.

- 1 THE ORGANIZATION
- 2 ROUTING OF JOB
- 3 BUILDING LAYOUT
- 4 EQUIPMENT



# Autogenous Welding in Automotive Repairs

By Thomas P. Bowman



This is the tenth installment of a series of articles that are to be published in MOTOR AGE each week. The author has had practical experience in motor car repairshops which enables him to present first-hand information on practical welding in a clear and concise manner. No difficulty should be encountered in this work, provided the reader will apply all the methods given herein.—Editor.

## Part XI—Aluminum and Copper

FROM the previous section it can be readily seen that a fusion weld of malleable iron is not practical, because of the variation in its composition. An attempt to weld it will produce a hard, brittle weld, full of blowholes, and of very little strength. To join this metal with the blowpipe, brazing is used. The metal is heated to a bright red heat, just below fusion, and tobin or manganese bronze is added as a filling material. A brazing flux also is used. This makes a generally satisfactory joint of this material.

### ALUMINUM

There are two general types of this metal of interest to the welder—rolled or drawn aluminum and cast aluminum. The commercial rolled metal varies in purity from 98 to 99.75 per cent, the impurities being silicon and iron. Pure aluminum is rarely used for casting purposes, because its strength is much less than that of aluminum alloyed with other metals. Zinc is the principal alloying metal, although small percentages of copper are very frequently used with it. The amount of zinc ranged from 5 to 25 per cent, according to the requirements of the casting.

Aluminum has a very low melting point as compared to other metals, 1215 deg. Fahr. It is of high thermal conductivity and has a high specific heat. From the standpoint of welding, its most important property is its combination

with oxygen. Due to the action of the oxygen in the air, aluminum always is covered with a thin coating of oxide. When fused, a heavy coating forms. The oxide is very refractory, melting at a temperature of about 5000 deg. The oxide is also of a greater specific gravity than the molten metal, with the result that if it is not removed it will be distributed throughout the metal. It has a short fusion range, retaining its normal properties up to a temperature near fusion, when it becomes pasty and then passes rapidly into complete fusion. Oxidation becomes severe just previous to fusion. The metal, when molten, is quite fluid. Gases such as nitrogen, carbon, monoxide, hydrogen, etc., are easily absorbed in aluminum and if not worked out will produce blowholes and porosity.

Because of the rapid fusion and fluidity of aluminum, welding requires a little practice to properly control it under the blowpipe. After this is done the welding is comparatively simple. The greatest difficulty is that of removing the oxide. On sheet aluminum work a flux should be used.

The composition of this flux is usually of alkaline fluorides and chlorides. It is applied to the weld by the welding rod or it is dissolved in water to a paste or liquid and applied with a brush. This flux will react with the oxide and form a fusible compound that will float to the surface, which further serves as a protecting coating and prevents absorption of gases. The welding rod should be as pure as possible, particularly free from certain metals, such as copper, that have a tendency to set up a galvanic action in the weld.

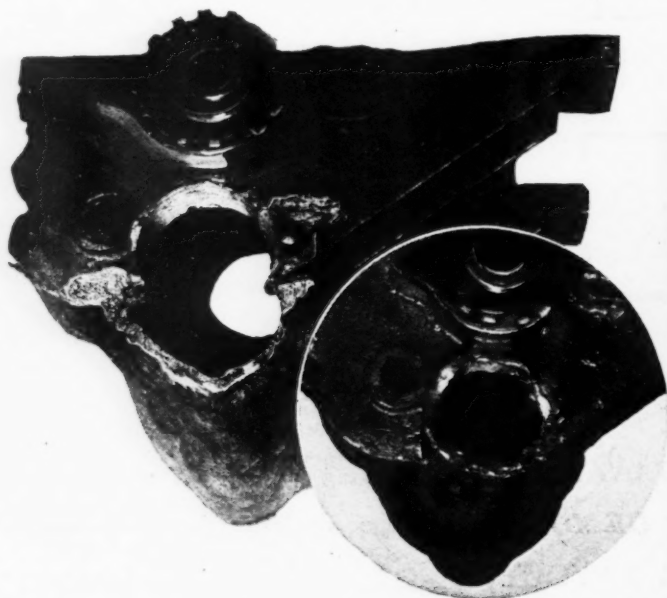


Fig. 37—A badly broken gear case which could be repaired in no way except by welding. The broken parts are missing, necessitating building up with new material, as follows: 11 cu. ft. oxygen, 8.47 cu. ft. acetylene, 2, lb. filler and 3 hr. A new case would have cost about \$45.

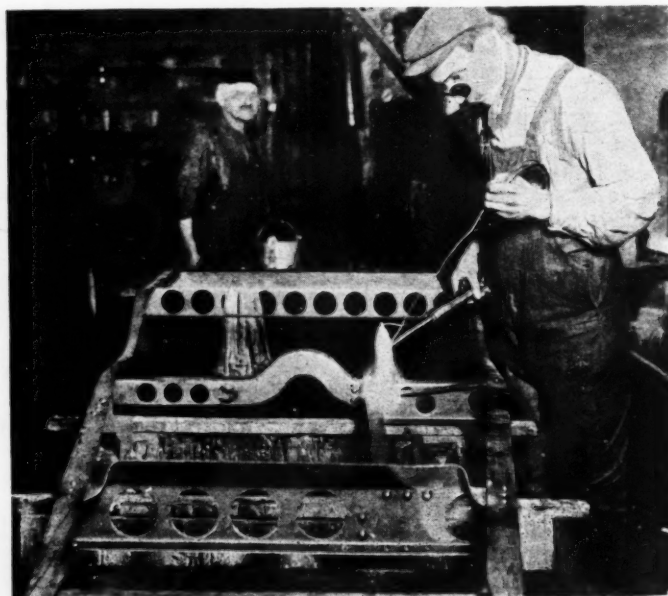


Fig. 38—Welding a truck frame, also a big saving





Fig. 39—Good and poor weld in sheet aluminum

In preparing the metal for welding, the edges to be welded and the adjacent surfaces should be cleaned carefully. In heavier sheets the edges should be bevelled. In the lighter sheets the welding will be aided by flanging them about 1/16 in.

All aluminum articles should be preheated to some extent before welding. In certain cases the playing of the secondary flame on the object will be sufficient; in others a more thorough treatment is required, such as charcoal or coke.

Aluminum castings are handled somewhat different from sheets or plates. Castings are of different composition. Since the metal has a low melting point, high conductivity and becomes rather fragile previous to fusion, preheating and cooling must be carried out very carefully. The average aluminum casting is somewhat complicated in its design, hence the necessity of skillfulness in carrying it through the preliminary heating period.

The use of a flux on castings has been abandoned by the majority of welders. In place of it they break down and remove the oxide by a paddle, which is also used to smooth off the surface of the weld after it is completed. When the weld is finished the casting should be allowed to cool very slowly and evenly.

#### COPPER

Copper usually is produced in a pure homogeneous form. The impurities are present in small amounts and are not affected materially by fusion. Copper is a good conductor of heat and is very tough, ductile and malleable. From these properties it would appear it is easily welded. Unfortunately this is not true. Few welders are skilled in the handling of this metal.

Two very pronounced properties are evident in copper under the blowpipe. It absorbs gases very readily, notably carbon monoxide and hydrogen. These are released when the metal begins to solidify, with the result that they remain entrapped, producing a porous structure.

Copper oxides vary rapidly when undergoing fusion. The

molten metal has the property of dissolving the oxide thus formed. It will take up such large quantities of it the mechanical properties of the weld will be affected. In addition to these two peculiarities, the tensile strength of copper decreases rapidly as the temperature is raised, particularly from 500 deg. Fahr. upward. The effect of temperature is so severe that at 900 deg. the tensile strength is only 40 per cent of that at atmospheric temperatures. Because of this weakening under heat, the strains resulting from contraction in the weld during cooling must be carefully dissipated, otherwise the metal in the weld or adjacent to it will fail.

A neutral flame always should be applied in welding this metal. If an excess of acetylene is used, the products of combustion are richer in those gases, which easily are absorbed. If an oxidizing flame is used, the weld becomes saturated with the oxide.

A larger blowpipe head than the melting point of copper indicates or suggests is used because of its high thermal conductivity. Where possible, auxiliary heating, such as air-gas flames and charcoal fires, should be employed. This is done not only from the standpoint of economy but it also aids greatly in the success of the weld.

The blowpipe flame should play on the weld in a vertical direction. The metal when molten is quite fluid, and for this reason if the blowpipe were applied at an angle the metal would be blown ahead, producing adhesion. Also, by applying the blowpipe vertically the molten metal is protected from the oxygen of the atmosphere by the enveloping flame.

The factor that contributes most to the successful welding of copper is the use of a properly formulated welding rod. Such a rod will overcome, to a great extent, both the absorption of gases and the solution of the oxide. It is not possible to remove the oxide in the weld by a flux, because it is dissolved in the metal. A rod is needed that has combined with it a reducing or deoxidizing agent. The reducing agent has a greater affinity for oxygen than copper, hence it combines with it and brings it to the surface in a fluid form. This material acts as a glaze or protecting coating for the molten metal beneath it, with the result that it tends to retard the absorption of the gases.

Several materials when added to a pure copper rod have proved to be beneficial. The most prominent element at this time is phosphorus. It should be present in amounts not over 1 per cent, otherwise the metal will be pasty and the weld will be weakened.

After welding, the grain of the weld and the metal adjacent can be improved by hammering at a low heat. It can be bettered further by annealing the entire weld to about 900 deg. and quenching it with water.

## Mississippi Dealers Plan for First Annual Meeting

NEW ORLEANS, LA., Aug. 29—Governor Theo G. Bilbo will lay down the cares of the state of Mississippi long enough on the morning of Oct. 9 to welcome the Louisiana-Mississippi Automotive Trades Association, some 600 strong, to Mississippi, when that organization assembles at Jackson in its second convention. Elaborate plans have been made by Mississippi dealers and state officials to entertain this, the first, dealers' convention the state has ever had. The meeting will be held Oct. 9-10, night sessions being held both days if necessary to dispose of the large amount of business on hand.

Senator B. P. Harrison of Mississippi will be one of the speakers on the second day of the convention, and much of the afternoon of that day will be taken up by an illustrated address by

a representative of the bureau of public roads of the department of agriculture, who will explain the good roads program of that bureau in Louisiana and Mississippi and point out how dealers can assist. P. M. Milner, head of the Louisiana Motor League; Duncan Bule, state highway engineer of Louisiana, and the state highway engineer of Mississippi also will be among the speakers.

Successful dealers of New Orleans will tell of their methods; the used-car situation will be discussed; the truck and tractor sections of the bi-state association will be represented by speakers, and C. U. McDowell, secretary of the association, will make a report on the work accomplished since the first convention at which the association was formed in New Orleans, July 10-11.

Believing that "all work and no play"

would make even Henry Ford a dull boy, the entertainment committee of the Jackson Automotive Trades Association, a branch of the bi-state body, is at work on an elaborate program of amusement and recreation for the visitors, details of which will be announced from the chair at the convention.

The association is occupying its headquarters at 712 Poydras street, and new members are coming in rapidly. Secretary McDowell, also general manager, reports organization of branch associations in Louisiana at Jeanerette, New Iberia, Crowley, Lafayette, Alexandria, Baton Rouge and Monroe; and in Mississippi at Vicksburg, Hattiesburg, Meridian, Clarksdale, Gulfport and Biloxi, with other charters pending.



# Law in Your Business

By Wellington Gustin



## PROOF OF THEFT

**A** SYSTEM of car theft has been uncovered in Minneapolis, operated under the guise of a second-hand garage. Conviction of the proprietor has been upheld by the supreme court of Minnesota.

The transaction which led to the ultimate undoing of the thief, Harry Monroe, occurred in Minneapolis. A South Dakota man, Keator, by name, parked his car near the Minneapolis Athletic club whence it disappeared shortly afterward. Two days later it was delivered by Monroe to a garage owner named Wattles with directions to change the tires and replace the top with a new one which Monroe brought with him. Wattles complied with the directions given him and Monroe drove the car away returning on one or two occasions during the succeeding few days for other minor repairs. He finally left the car at the Wattles garage saying he had sold it.

About a week after the theft of the car, the police located it at Wattles' garage. In addition to the top and tire changes the manufacturer's numbers had been filed off and new ones put in their place. The owner completely identified the car while neither Monroe nor the man to whom he had sold it pointed out any error in this identification nor did they claim ownership.

The court said the fact that Monroe delivered the car at the Wattles' garage for alterations immediately after the theft, made the conclusion the car was stolen at the time charged. There was no explanation of the defendant's possession or of his act in causing the changed appearance of the car, which was sufficient to justify the conviction of the person so in possession.

Not wishing to rest its case on this evidence alone, the state introduced evidence tended to show the practice of Monroe in a general system of similar crimes.

The evidence showed Monroe had been operating a restaurant and employment agency and engaged incidentally in the used car trade. He employed a helper named Morrison to assist him in the latter industry and caused him to rent a building to be used as a

**S** EEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. Motor Age in this and others of a series of articles will take up some of the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted him.

*What responsibility does a dealer or garageman assume for negligence of his employees?*

*Have you any security for advances paid a salesman?*

*What is the interpretation of legal speed?*

*Can you protect the name of your firm as a trademark?*

*These and other questions are answered here this week.*

garage. He informed Morrison of the character of the business as receiving stolen cars and, when changed sufficiently to destroy their identity, selling them. Among other duties Morrison assisted in making the alterations for which he was paid \$25 a car. During his employment six cars were brought to the garage by Monroe and the two, working together, subjected them to the treatment that would prevent future identification. The cars later were sold by Monroe.—State vs. Monroe, Supreme Court of Minnesota, 172 N. W. 313.

## PERSONAL INJURY RESPONSIBILITY

The doctrine that where an injury results to a person under circumstances showing the instrumentality producing the injury to be wholly under the control of another, the happening itself may be taken as evidence of the negligence of the latter was applied by the Supreme Court of New York in a recent case.



Pulvin brought suit for personal injuries sustained when he took a brass gas tank from his car to be repaired by a lamp concern. Some repairs were made, but these were unsatisfactory and the tank was brought back and the defects pointed out. The tank then was given to an employee to make the repairs properly. A few minutes thereafter an officer of the lamp company told Pulvin to point out to the workman how the repairs should be made. As Pulvin was proceeding to comply with this suggestion the tank exploded and he was injured. At the time of the explosion and injury the workman was attempting to remove or replace the soldering on the tank with a blowpipe open flame lamp. The tank was a square tank without any apparatus in it, was open at one end and appeared to be empty.

## Damages Granted

The court declared "it requires no argument to demonstrate that if the tank was actually empty it could not have exploded. The inescapable inference from ordinary knowledge is that there must have been either gasoline or the fumes of gasoline in the tank at the time of the attempted repair." The workman testified that he usually washed and carefully cleaned "gas tanks" but that while he cleaned this tank the first time, he failed to do so the second time. On this testimony judgment was rendered for Pulvin for the injuries he sustained from the explosion. Pulvin vs. Hudson Auto Lamp Works, 172 N. Y. S. 340.

## ADVANCES ARE DEFINED

Justice Pendleton of the New York Supreme Court recently ruled regarding contracts of employment providing for payments from time to time of fixed sums as advances against commissions to be earned. He held that in absence of expressed agreement to the contrary such contracts impose no liability on the part of the employee to repay if his commissions do not equal payments which are advanced only in the sense that they are to be deducted from commissions earned.

This decision was rendered in an action of Matthew Kane against the Auto

Laks Mfg. Co. The Auto Laks company employed Kane under an agreement which was to continue in force during August, September and October and which might be terminated thereafter at the option of the employer by giving six days' notice in writing to the employee if the sales of the employee should be less than \$6,000 for the three-month period.

Kane was allowed a commission on his sales against which he was to receive an advance of \$300 a month, to be deducted from the commissions when earned. Should his sales fall below the minimum average of \$2,000 a month and the employer cancel the agreement, a clause in the contract provided that Kane should be entitled to his commissions on sales thereafter made.

Payment of advances for August and September were duly made at the end of each month, but the employer, electing to cancel the agreement under his option at the end of October, refused to pay the advance for that month on the ground that the total commissions earned by Kane did not equal the advances made for August and September. The employee sued.

In deciding the case the court said "provisions for payment from time to time of fixed sums on account of, or as advances against, commissions to be earned, whatever the precise form of the language used may be, do not, in the absence of express agreement to the contrary, impose any liability on the employee to repay in the event the commissions earned do not equal the amount of such payments; that such periodical payments are advances only in the sense that they are to be deducted from any commissions earned and are intended as a minimum compensation, doubtless to provide for the employees' living or other expenses while performing the contemplated service. Bearing this in mind, it can make no difference in the rule of construction whether the monthly payment is to be made before or after the expenses are incurred." The advance was ordered paid.—Kane vs. Auto Laks Mfg. Co., 172 N. Y. S. 275.

#### WHERE LIEN IS INVALID

In an action for replevin by Harnstrom against a company to recover possession of his car, Justice McSurely of the Appellate Court of Illinois defined several important principles of law. He ruled that a verdict of \$100 damages was not excessive where the record shows that the plaintiff used the car extensively in making trips in the conduct of his business and was deprived of its use for more than three months by its wrongful detention.

He also ruled that when in the contract of sale of a car the seller agrees to give the buyer free monthly inspection service, in fulfilling this agreement no gratuitous act is being per-

formed and that there is a mutual benefit under which the seller becomes liable for injury to the car by ordinary negligence of its servants while driving the car to the seller's shop for such service.

Further, that in an action of replevin to recover possession of a car where the evidence shows the car was being held for the payment of the cost of repairs caused by defendant's negligence, it was immaterial that the defendant had a right to detain it for the payment of a small bill covering the cost of an appliance added to the machine under authority from the plaintiff. In other words, the lien rights to hold the car could not be asserted by the garage keeper in the trial where he had been defendant on other grounds, his lien rights being an incident of another transaction.—210 Ill. App. 396.

#### LEGAL SPEED DEFINED

Chase Mellen, an attorney of New York, was arrested for speeding by a motorcycle officer as violating a section of the highway law. The officer charged Mellen was driving at a rate of 42 m.p.h. Mellen admitted he was driving about that speed and was convicted in the court of special sessions.

The place where the arrest was made was outside any incorporated village, was not thickly populated and there was only one other vehicle on the road in the vicinity where the arrest was made. The motorcycle officer stated his only reason for making the arrest was because Mellen was travelling 42 m.p.h. and admitted that under the circumstances there was nothing reckless about his driving.

Mellen testified in his own behalf and stated that when arrested he was returning from Camp Upton on a clear, bright day. He observed the rate of speed permissible in going through villages and increased his speed upon the clear, straight stretches of road, the brakes and tires upon his car were in perfect condition, his car was at all times under control. He testified he had been driving cars for five years, having driven nearly 30,000 miles. He said he had driven in cities and never had an accident and that at the time of his arrest there was nothing in the way to obstruct his view and that as he came to a curve in the road he reduced his speed.

These details will show some of the elements which the driver of a car must observe to relieve himself of responsibility for careless or reckless driving and which would tend to relieve him of the charge of negligence in the happenings of an accident doing damage to another.

In this case the officer making the arrest proceeded upon the theory that a speed in excess of 30 m.p.h. was in itself a violation of the highway law, which specifies 30 m.p.h. as the legal

rate with the presumption that excess of this rate constitutes reckless driving.

Interpreting this section, the court said "I think that it is clear from a reference to the new statutes that the legislature intended to eliminate the absolute prohibition of speed greater than a specific number of miles per hour and to shift the burden upon the defendant, in cases where speed was shown to be over 30 m.p.h., of showing that he was not driving in a reckless or imprudent manner. In other words, the mere fact of speed in excess of 30 m.p.h. simply raises a presumption of imprudent driving which may be overcome by evidence. In this case I think the record clearly establishes that the presumption of careless and imprudent driving at the time and place in question was clearly and fully overcome by the testimony of not only the defendant, but of the officer who was the complaining witness." Therefore, the conviction was reversed.—People vs. Mullen, 172 N. Y. C. 165.

#### TRADE NAMES PROTECTED

A case involving the law of trade names and trademarks recently decided is that of the Auto Parts Co. against the Auto Sales & Parts Co., wherein the former sought and obtained an injunction against the latter from doing business under the name of "Auto Sales & Parts Co."

Regarding the extent of protection in the use of a corporate name, the court said that a corporation in business is entitled to protection in the use of the name under which it is incorporated to the same extent as an individual would be entitled to protection in the use of his individual name.

Regarding the use of a generic term as a trademark or trade name, it was held that while such names are common property and a private property interest in them cannot be acquired, relief should be granted where a name of this character has been adopted under circumstances which make it appear that the purpose of adopting such name was to mislead the general public.

It is the duty of one entering business or adopting a trade name or trademark to adopt affirmative precautions sufficient to make confusion and deception in the use of a trade name similar to one already in use improbable regardless of fraudulent intent and actual injury.

As to what constitutes unfair competition in the use of a corporate name it was held that the use of the name "Auto Sales & Parts Co." constitutes unfair competition of an older and established concern trading under the name "Auto Parts Co.", there being evidence that confusion resulted and no evidence of an innocent intention in making use of a name so similar.—Auto Parts Co. vs. Auto Sales and Parts Co., 211 Ill. App. 436C.



# Garage Planning

## Service Station Arrangements

### No. 98

#### Improving Garage Appearance

**Q**—I now have a frame structure on a lot and want to rebuild with one-story 10-foot, concrete block wall, with frame living quarters on second floor. Furnish idea as to looks, construction and approximate cost. I am on the main road from Philadelphia, Pa. to Atlantic City, N. J.—Henry N. Warker, American Hotel Garage, Egg Harbor, N. J.

We do not know from your letter just what you want to do, whether to tear down the frame structure you have or raise it and build the concrete block structure under it.

If you are on the main road from Philadelphia to Atlantic City, no doubt you are after the trade of transients and passersby, and in that case an attractive front would mean business and a mediocre or unattractive one would drive it away.

If you use the cement blocks, use the kind with smooth face and stucco them over, inserting some colored tile, which should be easily obtainable in your vicinity, to give a little color and snap. The second story might be shingled and stained an attractive color. See sketch with stuccoed gable and green blinds.

There isn't much room for a supply of accessories or tires, but perhaps you can steal room from your second floor living quarters for that. The location of a stairway to the second floor will be determined somewhat by the plan of your apartment.

We think you are limiting your future by the size of your building. Unless you can add to it later, you should start on a larger plot. You will hardly have room to store cars you are working on and, if you try to show a car

in your showroom, it will be at the expense of your tire and accessories business. You can't do any great amount of things but should limit yourself to accessories and repairing with a good stock of accessories and tires and facilities for small, quick repairs. You haven't room to do extensive overhauling jobs where cars will be on the floor for a considerable time.

### No. 99

#### Wants Plenty of Light

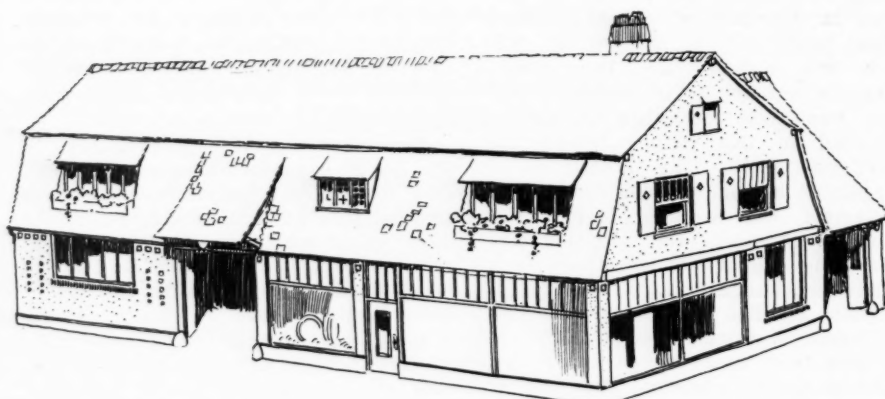
**Q**—We are inclosing sketch of a lot 120 by 125 with 40 by 100 feet already occupied. This is a level lot with the 80-ft. front on a main street which is 60 ft. wide and has no car tracks. We are considering building a two-story garage and intend to have ten departments. Sales, parts and accessories, shop, paint shop, battery shop, vulcanizing department, washing and greasing department, oil and greases and storage. We would like to display to good advantage at least five cars. We handle the Chevrolet car and a complete line of parts. Our accessory department should be large enough to enable us to handle \$15,000 supply of accessories and tires and tubes. We are contemplating putting in a modern battery paint and vulcanizing departments and are asking your opinion as to size, as in our present location we are not using any of these. We employ seven men in our repairshop.

In addition to the departments mentioned we want space for a large general office, a private office for manager and also for sales manager, a large waiting room for women and heating plant. The most essential part of the plant must be an abundance of light.—Henry H. Schultz, Capital Transit & Repair Co., Olympia, Wash.

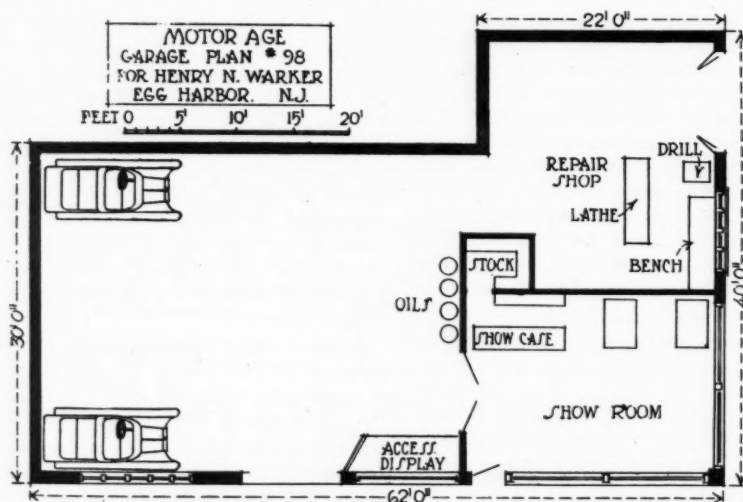
There isn't much to be said of this layout that cannot be seen by a careful study of it. The only shortcoming is the limited space for car storage on the main floor. There is no way of increasing the capacity, however, without cutting down the other departments considerably, which does not seem wise. The accessory department could be somewhat smaller and the total stock of parts and accessories moved to the second floor, from which location they could be handled by dumb waiter as wanted. The change would only add two or three cars and the added expense of handling the stock would more than offset any gain in storage revenue.

The roof over the garage section on the second floor could be trussed, but the first floor will need posts. Our arrangement looks rather helter-skelter, but as a matter of fact is not, posts being so placed as to not interfere with the movement of cars and at the same time carry the load imposed upon them.

Boiler room and coal bin are under the showroom where the boiler is centrally located and the room well lighted by sidewalk lights.



Exterior of garage that is very attractive



Interior of garage illustrated above

*MOTOR AGE* is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquirers are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

### 100 HART-PARRS A WEEK

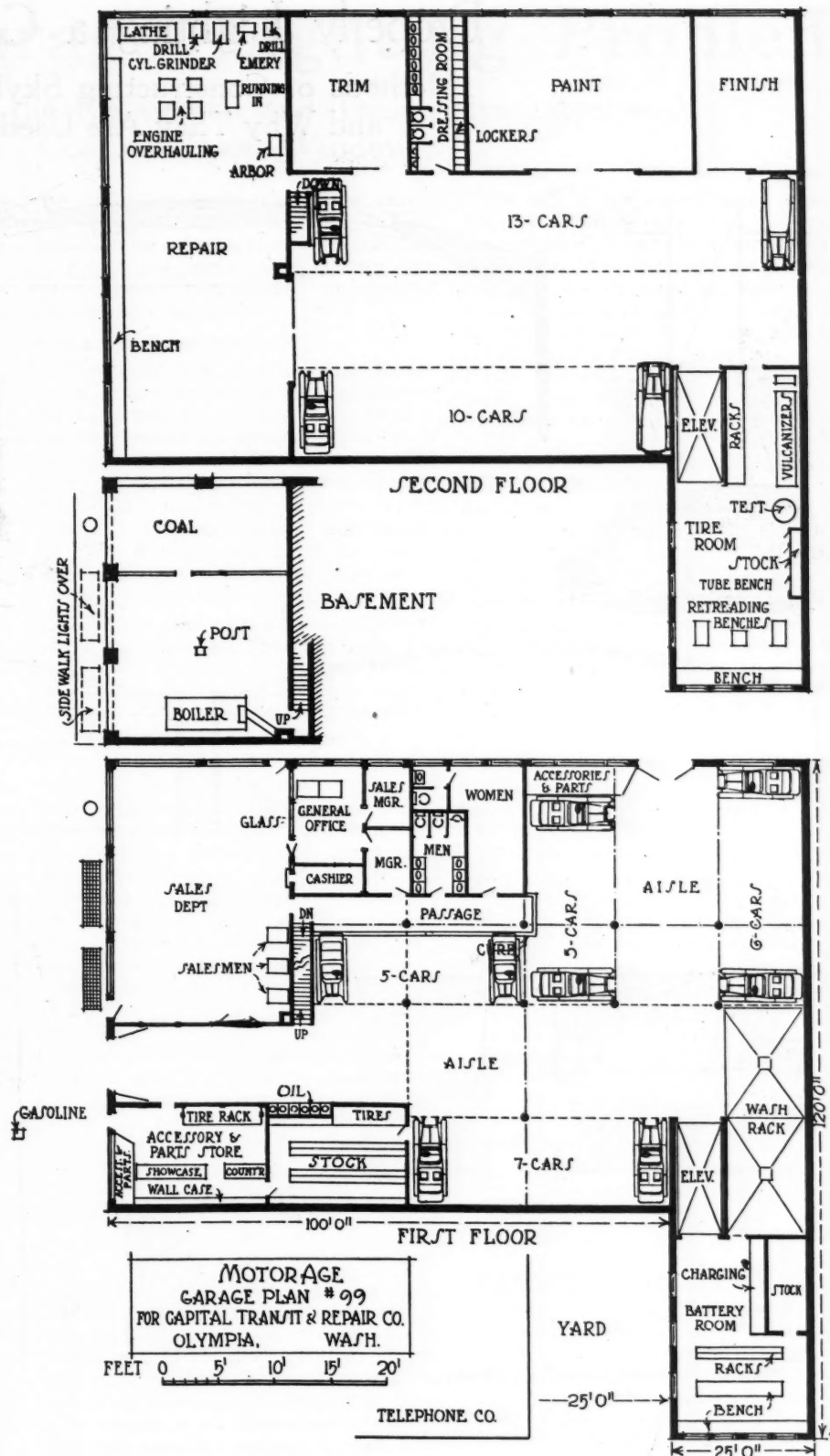
Charles City, Iowa, Aug. 29—The Hart-Parr Co. is producing 100 tractors a week with orders for 2000 booked ahead. For every tractor made they have ten requests for tractors. Orders are booked ahead throughout the winter and spring of 1920. Production increased 20 per cent last month. The demands have been so great from visitors to go through the works that the company has decided to allow visitors to go through the plant and has appointed a guide to take them on tours of the factory and explain the different departments and the making of the tractor.

### CITY LOSES 3285 CARS IN 1917

Chicago, Aug. 30—In 1917 3287 cars, valued at \$3,285,000, were stolen in this city and 2439 were recovered, according to figures furnished by the Automobile Protective & Information Bureau, a service organization of a dozen or more companies writing theft insurance. There were 108 arrests in that time and 102 convictions. In 1916 2611 cars were stolen and 1954 recovered. There were 222 arrests and 150 convictions. From Jan. 1 to Aug. 15 of this year 1255 have been stolen and 957 recovered.

### CHANGES ON WATERLOO ROW

Waterloo, Iowa, Aug. 29—There have been several changes on Waterloo's row recently, including some additions to the trade and shifting of agencies. The Cramer Motor Co. has taken on the



Layout of garage with departments plainly indicated

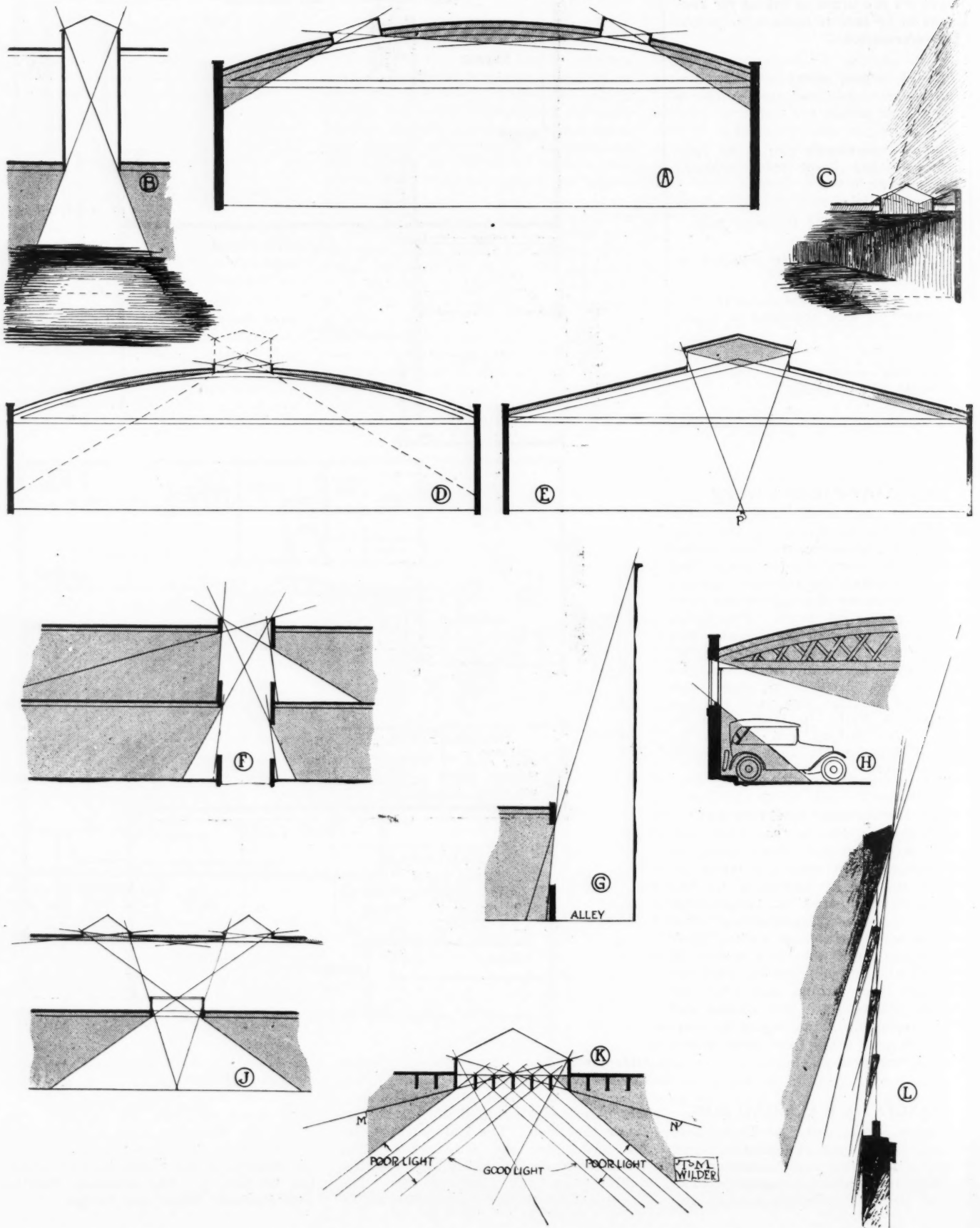
Oldsmobile line. The Waterloo-Buick Co. has been organized to handle Buick sales and the West Motor Sales Co., which formerly handled the Buick, has taken the Nash. The Union Motor Car Co. has added the Studebaker. The Waterloo-Nash Co. has added the Republic truck and Stephens car. The Transport truck has been taken on by

the Waterloo Auto & Supply Co., and a squad of three trucks recently was driven out from Mount Pleasant, Mich., each truck carrying an Oakland car which the Waterloo Auto & Supply Co. also handles. The Peverill Motor Sales Co. expects to move into its new building by Nov. 1. The company distributes Hudson, Essex and Dodge.



# Properly Lighting a Garage

Methods of Constructing Skylights  
and Why They Are Used



# Solving Garage Lighting Problem

## Skylights in the Repairshop and Their Advantages as Compared with Windows

**T**HE problems met with in properly lighting a garage are many and baffling but should be mastered by a little study of the principles involved. Light will not flow through pipes like air or water or turn corners unless forced to do so. Its principal characteristic is that it always travels in a straight line and can only be swerved from its course by two causes, refraction and reflection.

Reflection is the throwing back of the light and is of two varieties, which we might call real or direct and indirect or diffused. In the first the reflecting surface is even and polished, such as a mirror, and the observer sees the object apparently behind the surface in its true form. The second case is the type we are more interested in. Here the reflecting surface acts as an illuminator. It glows from the light it receives from the original source, usually

the sun. The moon is the best example of this indirect reflection. It possesses no incandescence of its own nor does it reflect the sun's rays directly but from being brilliantly illuminated shines quite brightly.

### Reflection From White

The white face of a building illuminated in the sunlight in turn will throw its light into the darkest corners of a building across the street. White pavements reflect light through the windows to the white ceilings of rooms which, in turn, reflect it down to the work of the occupants. But if the building is not white or if the sun is not shining, very little illumination emanates from such a wall.

Consequently we cannot depend very much on such independent light but must seek a source more even though at times less brilliant.

The sky is the source most dependable, and wherever there is a possibility of skylights we can be assured of the best light. The diagrams on the opposite page are all based on light coming from the sky and bring out very clearly the increased value of skylighted rooms over window-lighted ones, especially where the windows are opposite walls. In such cases conditions can be improved somewhat by painting the walls white to improve their reflecting powers but even this does little good if the walls face north so the sun does not shine on them.

Lower floors cannot be lighted by side windows on alleys or courts with any degree of success except by the use of some of the prism devices designed for this purpose. We even doubt the great value of these except where they are tipped at an angle to give them a greater expanse to the sky.

## Different Methods of Lighting a Garage

**A**—In lighting a 56-ft. garage with a minimum expanse of skylight the method here shown is considered the best. There is one skylight between each two trusses, but they are alternated between the two sides so that between the first two the light is on one side, between the next two on the other and so on.

**B**—This shows the limited area lighted on the first floor by a light shaft coming through the second floor. Prism glass at the lower at the lower end of the shaft would improve this condition by diffusing the light.

**C**—It is inadvisable to place a skylight so near to a high wall that it will only get about half of the direct light from the sky that it should.

**D**—Centrally located skylights give a

flood of light in the center, but the sides of the room are always dark. Side windows help this condition. See **H**. Note the difference in direct light when the skylight is high or low.

**E**—The Monitor type with windows on the sides is better for central location if the sides are far enough apart to prevent a large dark area with center as at **P**. This style gets the light evenly distributed and well to the sides.

**F**—Here is shown the different effect of high and low windows on a court and also the difference in value of windows on an upper and lower floor. Neither high or low windows are of very great value on a lower floor.

**G**—A high wall across the alley is most disastrous to window lighting.

Painting the wall white helps but even then, unless the sun is shining on it, the light is very poor.

**H**—Low windows are of little value where cars are backed up against them. They should be as high as possible, way up to the roof so that the light will come in over the cars.

**J**—A scheme of this sort to take the place of **F** would greatly increase the light on the first floor, give perfect light on the second floor and also increase the first floor area and decrease the expanse of glass.

**K**—**L**—Rafters extending across under a skylight greatly decrease its effectiveness, and in like manner windows receiving light from a high angle are made much less efficient by many cross bars.

### ARMY TO RETAIN THESE MOTORS

Washington, Aug. 29—The following types of trucks and cars are to be retained by the Army for its use, it is announced:

**Type 1**—Cars: Medium open, Dodge, medium closed, Dodge; heavy open, Cadillac; heavy closed, Cadillac.

**Type 2**—Light delivery truck, ½-ton light delivery, Dodge; ¾-ton, White; ¾-ton, G. M. C.; 1-ton, White.

**Type 3**—1½ and 2-ton trucks, White Garford, Packard.

**Type 4**—3 and 4-ton trucks: Standardized B, Riker, Mack; 3½-ton trucks, F-W-D.

**Type 5**—5-ton trucks or over, Mack, 5½-ton trucks, Mack.

**Type 6**—Motorcycles, Harley-Davidson.

**Type 7**—Ambulances, G. M. C.

**Type 8**—Trailers, cargo: trailers, ¾-ton, tank, water, 180 gal.; trailers, ¾-ton, ration and spare parts; trailer 1½-ton two-wheel, light aviation; trailers, 1½-ton, four-wheel, cargo; trailers, 1½-ton, four-wheel special bodies, trailers, 3-ton, gun and cassion; trailers, 4-ton, four-wheel, cargo; trailers, 4-ton, four-wheel, special bodies; trailers, 5-ton, tire press; trailers, 10-ton, portable crane; trailers, 10-ton, Tank Corps with ramp.

### Kitchen Trailers

**Type 9**—Trailers, kitchen; trailers, 1½-ton, two-wheel, kitchen, A and B type.

**Type 10**—Trailers, machine shop; trailers, 4-ton, four-wheel, machine shop, spare parts.

### EXHIBITORS FOR ANNUAL SALON

New York, Aug. 29—Seven foreign makes of cars, as well as American models and accessories, are named in a list of exhibitors just made public for the annual motor car salon, to be held here at the Hotel Commodore Nov. 16-23. The European lines to be shown are announced as the De Dion Bouton, the Peugeot and Renault, by French makers; the Rollys-Royce, the Sideley-Armstrong and the Sunbeam, by English factories; and the Lancia and possibly the Fiat, by Italian makers.

American exhibitors so far announced are Brewster, Cunningham, Daniels, Locomobile, Meteor, Phianna and Porter. Body builders to exhibit are the Ostruk, Fleetwood, Holbrook and Rubay.



# Storing Cars in Storied Elevators

Increasing Capacity of Garage—Parking in Congested District—Quick Service to Owner



Cross-section of elevator garage showing how it operates

OUT of the west novelties are always coming. Now the Smith Frazier Elevator Storage Garage is introduced by Martin C. Smith of Portland, Ore.

As shown in the illustration it is half above and half under ground and consists of any number of elevator units holding any desired number of cars superimposed. In a word, the total storage

capacity of the garage is in these huge elevators, which can be raised high enough to discharge the lowest car on the main floor or dropped low enough to allow the upper car the same action. Cars are always available for their owners in a few seconds even in the morning and evening rush hours.

Aside from the fact that probably a

foot more space would be needed than usually allowed for cars, the capacity of the garages would be multiplied by the number of compartments in the elevators. In other words, a 50 by 160-ft. garage that ordinarily would hold fifty cars, if equipped with seven car elevators, would take care of 294 cars.

It is because of this feature, coupled with speed in handling, that the inventor especially recommends it for downtown use in congested districts. A customer calls for his car; the attendant raises or lowers the elevator containing it until it is at the ground floor level and the customer gets in and drives away, very little more time being consumed than in the ordinary ground floor garage.

In the illustration is shown a basement floor used solely for washing purposes, to which all the cars in the garage are accessible except the ones in the top compartments.

The floors of the elevator compartments are crowned up in the center to carry any drippings to the outside and pitched back so that there will be no tendency on the part of cars to roll out.

There should be a good future for this system if conditions in our cities continue to get worse.

## SUPER-TREAD TIRE SOLD

South Bend, Ind., Aug. 29—The Super-Tread Tire Co. has been sold to Chicago and New York interests represented by William Kahl and Fred Caton of Chicago. The consideration is approximately \$1,000,000. Of this amount \$500,000 is for patent rights and \$500,000 for factories in South Bend and elsewhere and good will and interest in the company.

The new owners have announced that the concern will be greatly enlarged and will erect new factory buildings in this city. It also is announced that a \$10,000,000 corporation will be formed. The officers of the corporation are: President, Clyde L. Smith, South Bend; vice-president, William Kahl, Chicago; secretary-treasurer, Fred A. Caton, Chicago. The Super-Tread Tire Co. was organized three years ago.

## TO MAKE NEW TRUCK AXLE

Cleveland, Ohio, Aug. 29—A new \$1,500,000 corporation for the manufacture of double reduction truck axles has been formed to manufacture the axles developed by Leo Melanowski, who has been working on the development of them for some time. The corporation known as the L. M. Axle Co. was formed July 23 and purposes manufacturing three different types of axles with 1½- to 3-ton capacity.

# The Motor Car Repair Shop

## Practical Maintenance Hints

### Average Setting for Timing an Engine

MANY who are connected with a service station are of the opinion that motor car engines cannot be timed unless the exact timing for that particular engine is known. While this is true to a certain extent, it does not hold good throughout, the engine can be set at an average setting and will run, giving good service. Of course, if the exact setting of the valves is known, it is much better to set accordingly, rather than depend upon a rule of thumb.

It is rather the exception for a service station to have an exact time setting for all engines, so we have calculated an average setting that will give satisfactory results for all engines, unless the engine is freakishly different from the rest, and the chances are exactly 114 to 1 that the setting will be right rather than wrong.

The pitch of the timing gears is generally coarse enough to allow of only one proper setting, and when the proper position is almost reached the tooth of the camshaft gear which should mesh between the two teeth on the crankshaft gear, will be so close that less than the width of one tooth will be between that and the exact position.

This approximate position of the timing gears with reference to one another, determined by the average

setting for 114 cars, is as follows: intake opens 9.5 deg. late and closes 37 deg. late. The exhaust valve opens 50 deg. and closes 9 deg. late. It is not necessary to pay attention to more than one of these dimensions when setting the camshaft, for the cams are generally all on the same shaft and integral with it, so that the relation between the different cams is constant. From this it follows that if one position is determined, the rest of the dimensions given will follow in their natural order.

#### CORRECT METHOD FOR SETTING BATTERY IGNITION TIMING

Most battery ignition systems are timed in the retarded position so that the breakers open about  $\frac{3}{4}$  in. of flywheel travel past upper top center. If the ignition head is equipped with automatic advance the timing must necessarily be very accurate, and it is next to impossible to do this by watching the opening of the breaker points by eye. It is well known that this is not an accurate method and is not as fast a method as the following.

One of the best known methods to obtain accurate timing of the ignition is to place a 6-volt lamp in the low-tension of breaker circuit. Take a 6-volt lamp and equip it with a pair of short terminals and a pair of snap connectors. Now pull off the positive

wire on the ignition head coming up from the battery and connect one lamp terminal to the battery wire and the other to the terminal on the ignition head.

When the engine is turned over and the breakers close the lamp will light. But the timing must be set so the breakers will just open when the ignition timing mark on the flywheel coincides with the center line marker on the flywheel housing. To obtain the correct setting, set the ignition head so the light will go out, indicating that the breakers have just opened, when the flywheel mark and the center line mark on the housing coincide.

This gives a far more accurate method than timing by eye, for if one will examine a setting made in this manner, it will be noticed that it is impossible to tell whether or not the breakers are open, yet we know that they are open electrically, which is the desired situation.

#### HOW ONE DEALER KEEPS HELP

Indianola, Iowa, Aug. 29—The labor problem which has proved such a bugaboo to motor car dealers and garagemen has been solved in a satisfactory manner by R. L. Igo, Ford dealer here. About two years ago Igo, who was having more or less trouble keeping good mechanics, hit on the scheme of paying his men a minimum wage of at least \$27 a week and if they took in more than twice their salary during the week, dividing all over the guaranteed wage on a fifty-fifty basis. As the minimum rate for labor per hour is \$1 the mechanic easily can make a second salary in addition to the amount agreed upon.

On all accessory sales the mechanic makes he is allowed a 10 per cent commission. Whenever the mechanic works on new cars or garage labor for the firm this is paid for at a rate of 60 cents an hour. To prevent dissatisfaction among the men getting too much shop work and not enough owners' repairs the foreman checks up each day to see that every man gets an equal share of the higher-paid labor on the owners' cars. As most of the jobs on Ford cars are taken in at a set price for the work it is up to the workman to use special care in doing a good job, for if he has to do the work over again he does it on his own time at his own expense.

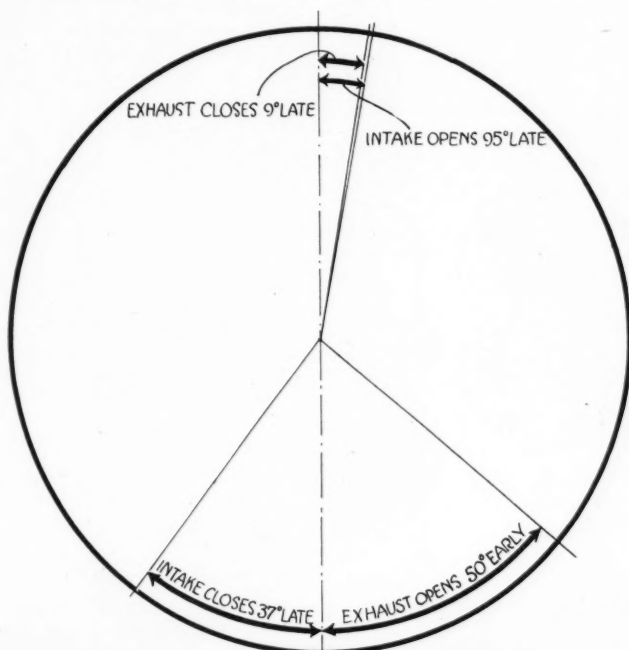


Diagram for use when exact timing is unknown



# The Readers' Clearing House

## Questions and Answers

### Piston and Ring Fitting

**Q**—Last winter we had the cylinder block on a C-37 1915 Buick touring car rebored and oversize pistons with new rings and wristpins put in, also new timing gears. Contrary to reason the engine lacks pep, although the valves were ground and carbon burned. This overhauling was done by some of the best mechanics in the city. Even though we had just burned the carbon, advancing the spark caused it to knock prematurely, but even with the spark advanced I do not have the power and pep I should have.—Earl R. Shepherd, Ottumwa, Iowa.

This is the old trouble of not fitting the pistons and rings properly. If you will read over last week's issue of Motor Age, you will find a complete discussion of this with the proper methods for fitting rings illustrated.

### Removing Magnetos From Flywheel

**Q**—Would it help the speed of a Ford to remove the magnets from the flywheel?

**2**—Show method of using force feed oil pump on a Ford.

**3**—Do you advise setting engine back? If so, how much?

**4**—What is the best wheelbase to use?

**5**—With what do you grind the heel of a cam off? Show method of doing same.—Bethel P. Browne, Henderson, Ky.

**1**—We cannot see where the speed of a Ford engine would be increased by removing the magnets from the flywheel. It is true this will lighten the revolving weight considerably, but if the revolving weight is balanced, a

### Conducted by B. M. Ikert Engines

lightweight flywheel has no advantage over a heavy flywheel.

**2**—Fig. 14 shows a force feed lubricating system designed for a Ford engine.

**3**—If the car is to be lowered on the springs, then it is advisable to set the engine back at the same time. It has

been found that if the engine is set back about 6 in., the balance of the car is improved wonderfully. If the suspension system is lowered in the proper way, it is possible to set the engine back on the frame without changing the torsion tube or the propeller shaft. The proper suspension method requires that the front axle be set slightly in front of the springs on an offset hanger. The rear axle should be set in back of the rear cross member of the frame and support made with an offset hanger.

**4**—Using a suspension method such as in outlined in preceding, the wheelbase becomes 106 in.

**5**—The camshaft can be ground by using a portable tool post lathe grinder and setting the shaft up on its centers in the lathe. The shaft should be accurately centered between the lathe centers. It is advisable to mesh the back gears on the live end. This will permit of a slow motion for the shaft. The lathe must not be driven by power but should be turned over by hand. The tool post grinder should be set so it will grind off about  $\frac{1}{8}$  in. from the radial portion of the cam. The first cut can be taken off from any part of the radial section, and then the lathe

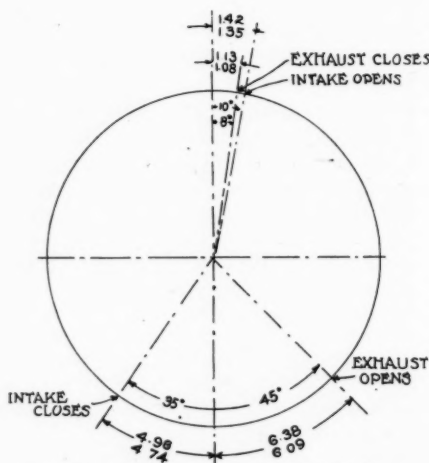


Fig. 1a—Timing diagram of Dodge

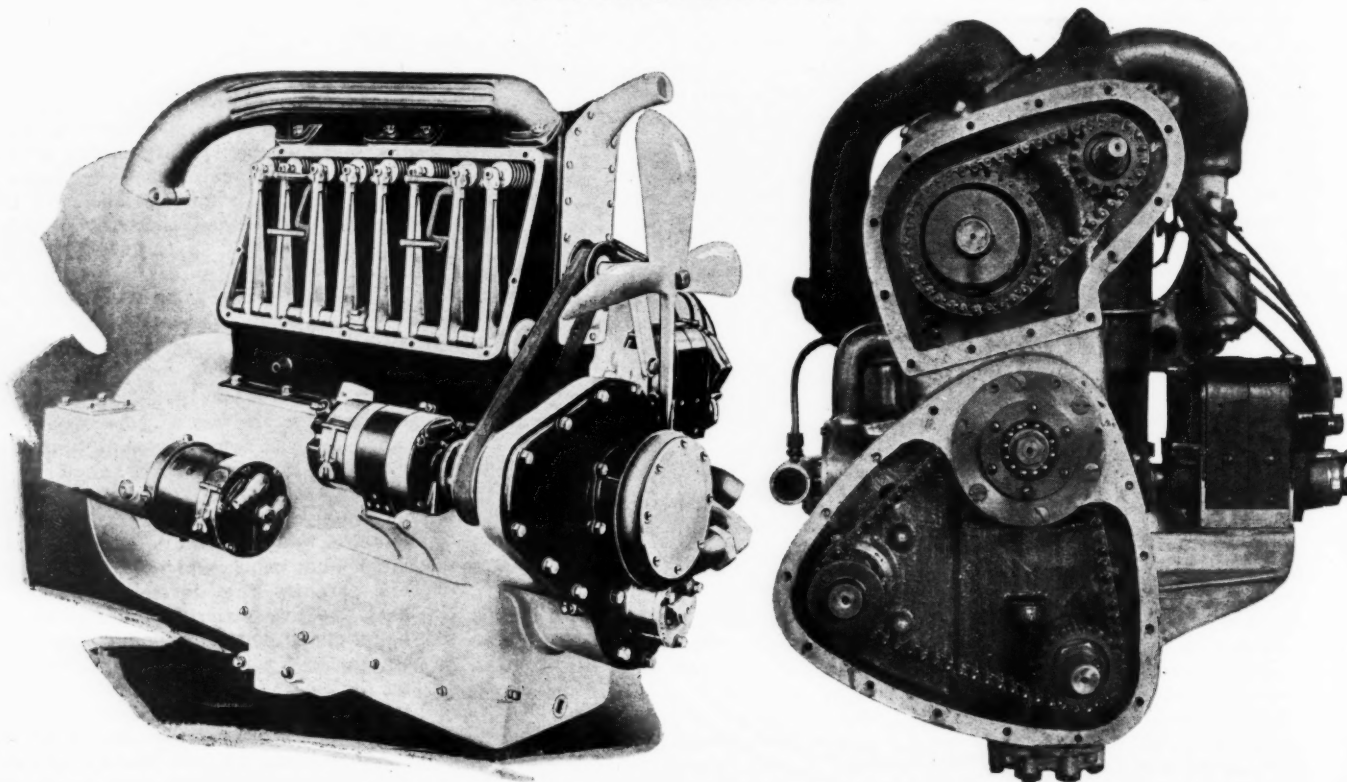


Fig. 1—Duesenberg engine, left, and the new Monsen chain-drive used on Revere

should be turned a slight bit by hand and then another cut taken. The screw feed movement should be disconnected and the lathe apron moved with the handwheel. In this way small portions of the cam can be ground off at each feed. Care should be taken to see that the shaft is not revolved so that the grind stone cuts any of the tangent portion of the cam.

#### Engine in Revere Car

The Revere engine which was illustrated and described in the Aug. 21 issue of Motor Age is a Monsen engine. This engine was designed by Adolph Monsen of the Revere Motor Car Corp., in co-operation with Gil Anderson and Tom Rooney, both former race drivers. The Revere company uses both the Duesenberg engines and the Monsen engine in its cars. The Duesenberg engine with which the cars are equipped is shown in Fig. 1. An illustration of the Monsen engine is shown in Fig. 1. The chief difference between this engine and others is that it has master head which is removable and which contains magneto, generator, fan, oil pump and water pump.

#### Carbon on Engine Valves

Q—Do the valves on a Willys-Knight engine carbon and leak compression as badly as the other type of valves?—Reader, Moyers, Okla.

There is less opportunity for a sleeve-valve engine to accumulate carbon on the valves than poppet-valve engine. The intake port cannot very well become clogged because there is no carbon-forming gases in contact with it. The exhaust valve, while it is in contact with the carbonizing gas, cannot collect deposits very well, because the sliding sleeves scrape the carbon off at every stroke, and any deposit tending to reduce the size of the port does not remain there long, because the extremely high gas velocity blows the carbon off from the valve. On the whole, the sleeve valve engine of the Knight type is less apt to suffer from carbon than poppet-valve engine.

#### Two-Cycle Engines

Q—I notice some Fords will run faster than others by advancing the spark lever. I have a 1918 model that has the speediest engine of any I have ever seen. When I advance the spark and open the throttle quick it will jump almost like a Buick Six. The ones that advancing the spark will not affect will not pick up that way. Will adjusting the spark pull rod overcome this trouble?

2—Give the simplified method of timing a Dodge Brothers engine.

3—Explain the operation of a two-cycle engine.

4—Where can I get a fiber time gear for a Ford similar to those used on the old model Oldsmobile?

5—Explain the action of the split nut and worm type steering gear used on a Buick car.—Jesse P. White Jr., Lexington, Ala.

1—The differences in these cars is attributed to the whims of the different inspectors. Some inspectors will not O. K. a car unless the bearings are set up very tight, it being their theory that a new car should be tight and that it will wear itself into shape before it has run very far. Other inspectors will have the bearings set much more loosely, thus permitting the engine to

TO assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

#### ENGINES

Earl R. Shepherd.....Ottumwa, Iowa  
Bethel P. Browne.....Henderson, Ky.  
Reader.....Moyers, Okla.  
J. P. White, Jr.....Lexington, Ala.  
LeRoy Halsey.....Charleston, S. C.  
George M. Snyder.....Richmond, W. Va.  
Walter Fries.....Bedford, Ohio  
Talmage Wesley.....Langford, Ark.  
Roslyn Swank.....Sidell, Ill.  
Reader.....Spur, Mich.  
R. B. Biggs.....  
.....River Road Garage, Tiffin, Iowa

#### MISCELLANEOUS

Edward Dreis.....Chicago  
John Van Costing.....Litchville, N. D.  
L. Stauthammer.....Green Valley, Ill.  
F. M. Morris.....Mason City, Iowa  
R. W. Buhrmaster.....Chicago  
J. H. Quick.....Boulder, Ill.  
H. D. James.....Detroit

#### THE ELECTRIC SYSTEM

W. E. Farrar.....Flint, Mich.  
A. J. Carter.....Electra, Texas  
E. H. Craver.....Green River, Wyo.  
W. A. McDowell.....Uniontown, Pa.  
Everett Cornell.....West Helena, Ark.

#### CARBURETION

J. P. White, Jr.....Lexington, Ala.  
A. E. Dittweller.....Cleveland, Ohio  
F. G. Phelps.....East Cardonlet, Ill.  
Earl Short.....Lake City, Iowa

#### REBUILDING

John Rensberger.....South Bend, Ind.  
No communication without the writer's name and address will be answered in these columns.

run at a faster speed. It very often happens that the spark lever is not set at the proper position. This can be determined by advancing the spark a great deal on a heavy pull. If the engine begins to labor and pound, then the setting is right. The timer lever should be adjusted to meet this requirement.

2—The Dodge car is timed as follows: The intake valve opens 10 deg. after upper dead center and 35 deg. after lower dead center. The exhaust valve opens 45 deg. before lower dead center and closes 8 deg. after upper dead center. In order that these directions may not be misunderstood we

are printing the timing diagram in Fig. 1a. The flywheel on the Dodge is 16 1/4 in. in diameter for the cone clutch and 15 1/2 in. in diameter for the disk clutch. One degree, therefore, when measured on the circumference of the flywheel spans a distance of 0.1418 in. for the larger wheel and 0.1353 in. for the smaller wheel.

3—A two-cycle engine, as it is called, performs a complete cycle of work in two strokes of the piston. The engine has an intake, a compression, a power and a scavenging stroke. These four operations are performed in one revolution of the crankshaft, as is explained with the aid of the diagram shown in Fig. 2. In the two-cycle engine use of the down stroke as a compression stroke to compress the air in the crankcase is made. First it should be remembered that a two-cycle engine has no valves. The gas passages to the cylinders are controlled by the piston as it covers the ports in the lower parts of the cylinder.

On the first downward stroke of the piston the mixture in the crankcase chamber is compressed. In order that this compression may be as high as possible, two-cycle engines are made always with a very small crankcase. Also each cylinder has its own individual crankcase compartment which is entirely separate from the other. When the piston has descended its full stroke it uncovers a port in the side of the piston, through which the exhaust gases pass out. While the piston was descending the gas in the crankcase was being compressed. This is the main difference between the two-stroke and four-stroke engines. Each side of the piston performs a portion of the cycle of operation. When the piston has descended clear to the bottom, the intake port is uncovered. In the diagram this port is shown connected to the crankcase.

The first port to be uncovered by the piston is the exhaust port. A slight further travel uncovers the intake port, which puts the crankcase and the combustion chamber in direct connection with each other. The gases in the

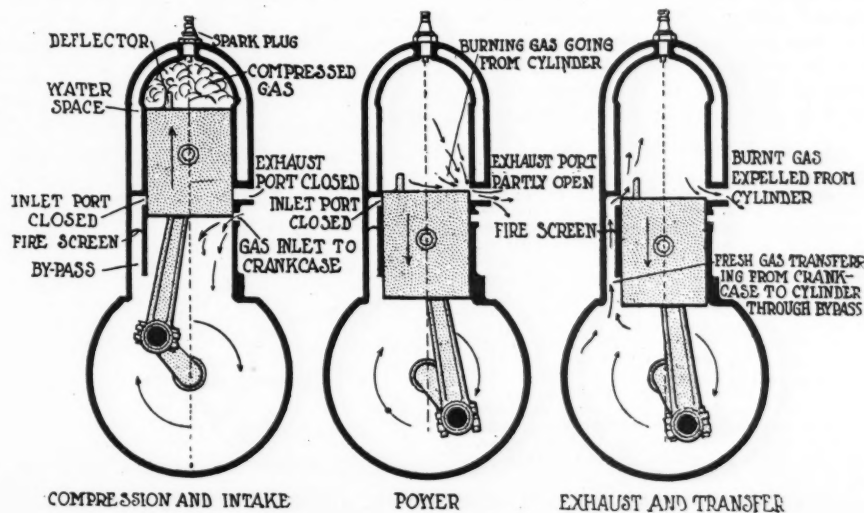


Fig. 2—Diagram explaining operation of two-cycle engine



crankcase rush through the connecting passage into the cylinder, where they strike the baffle plate on the top of the piston, where they are deflected upward. The intake gases in this way force the exhaust gases out.

The piston now starts on its upward stroke. During this stroke the gas in the cylinder is compressed, and since the volume in the crankcase increases, the mixture expands; this produces a vacuum in the crankcase. The atmospheric pressure outside of the crankcase port being greater than the pressure within the crankcase at this, forces the mixture into the crankcase through the port. The carburetor on a two-cycle engine is placed either before the crankcase inlet valve or else connected to the passage between the crankcase and the cylinder. When the carburetor is placed at the entrance to the crankcase difficulty is experienced at times from crankcase explosion, due to the fact that the mixture is too rich, which causes it to burn slowly and ignite the incoming gases from the crankcase. When the carburetor is placed at the entrance to the cylinder this difficulty is eliminated, for only the air of the mixture is compressed in the crankcase.

#### Fiber Gears

4—Fiber, or composition, gears can be secured from the following makers: Boston Gear Works, Norfolk Downs, Quincy, Mass.; Crofoot Gear Works, 31 Ames street, Cambridge, Mass.; William Ganschow Co., 1001-05 Washington boulevard, Chicago.

5—The split nut steering gear of the Jacox type used on the Buick car is shown in Fig. 3. Turning the steering gear with this type of gear moves the two half nuts within the gear housing. One nut moves upward and the other down. The two nuts A and B each make contact with the rollers C. These rollers are secured to the cross-shaft, which in turn is secured to the drop link arm. When the nut B moves downward it forces the roller C immediately below it to revolve about the center of the cross shaft O. The nut A moves in an opposite direction, while the second roller C moves upward, following the nut A. With this type of gear it is necessary to make only one adjustment to take up for wear. The collar D is the point of adjustment.

#### Buick Engine Pumps Oil

Q—A model D-45 1916 six-cylinder Buick pumps oil. I have this trouble in cylinders Nos. 2 and 4 but to a lesser degree. The trouble develops suddenly in cylinder No. 6, which sometimes is literally full of oil, then again the engine will run as long as a week without showing any signs of the trouble. I can keep from having this trouble if I do not have more than 1 qt. of oil in the crankcase, but I am sure this is a dangerously low level. If I put in oil until it runs out of the petcock in the base, which is the correct level, I will put the engine out of business. I have put in a full set of new rings, the cylinders are not scored and have fair compression and power but the trouble is as bad as ever. Would non-leaking rings remedy this?—LeRoy Halsey, Charleston, S. C.

A new set of patented rings will undoubtedly remedy the trouble. The en-

gine should not be run with only 1 qt. of oil in the crankcase. The oil level with this amount of oil is extremely low and beyond the point of safety for operation. In putting in the new rings be sure they are properly applied. For full directions see the answer to E. D. Brown, Newton, Miss., last week.

#### May Be Weak Cylinder

Q—I am under the impression that this 6-36 Moon car has too much lost motion somewhere in the running gear. When I idle down to around 8 or 10 m.p.h. I frequently notice the car has a tendency to lurch. I can feel this, besides, there is a noise due no doubt to the lost motion being picked up quickly. To test out just what this lost motion is I have several times jacked up one of the rear wheels and put the car in gear. When I do this I can turn the back wheel a distance of about  $2\frac{1}{4}$  in. measured on the center line of the tire. In other words, any given point on the center of the tire will move back and forward about  $2\frac{1}{4}$  in. without moving the engine. I have always felt this was too much and would be glad to have your idea about it.

I have taken the car down a couple of times and I know there is nothing loose in the gearcase and that there is no undue backlash between the pinion and ring gear. My idea is that most of the lost

motion is in the transmission, particularly between the sliding gears and square shaft, but this hardly seems possible, as no doubt all these gears are made to standard practice. I would like to know just what is the normal amount of lost motion between the engine and rear wheels and if my car has more than the average car and if so, is there any way it can be corrected.—George M. Snyder, Richwood, West Va.

This lurching or missing action as you describe it is not caused by undue backlash in the power transmission system. A backlash of  $2\frac{1}{4}$  in. is proper for a car of your size. The writer has seen some cars where this backlash was all of 12 in. and no missing or lurching action developing.

In our estimation there is a weak cylinder in the engine.

Either that, or the ignition system misses a spark occasionally. A faulty spark plug porcelain very often causes a similar condition. A leaky valve has been known to cause the same trouble. When an engine turns over so slowly the power developed is slightly in excess of the power consumed by the compression strokes a leaky valve is apt to cause this cylinder to deliver a weak stroke. This produces a lapse in the continuity of power transmission. During this lapse the engine speed decreases and before the engine can be speeded up again the car speed decreases. As soon as the next cylinder delivers its impulse to the flywheel the engine begins to accelerate, with the result that there is a slight jerk upon the entire car.

To correct this evil first see that all the valves are tight and that the valve clearance is 0.003 in. on all intake valves and 0.004 in. on all exhaust valves. Then the spark plug should be examined, making sure that the terminal point of the plugs all have the same air gap, approximately 0.025 to 0.030 in. The distributor should be clean, and the breaker points should be dressed up and adjusted. The proper clearance between the breaker points is 0.018 to 0.020 in.

#### Engine Needs Tuning

Q—The engine on an Overland 83B starts easily and will run for about 10 min. and then stop. When cranked again it starts right away and fires five or six times and stops again. If I give it a little more gasoline, it stops right away. It does this about six times and then runs good again.—Walter Fries, Bedford, Ohio.

These few statements tell a whole story concerning the condition of the engine in your car. The engine needs a tonic, it needs to be overhauled, and the carburetor needs to be adjusted. A compression test no doubt will indicate considerable power is being lost by the loss of compression. As soon as the engine becomes heated a little the gasoline vaporizes more readily and the engine then runs. You should have the valves ground in. Then the valves should be re-adjusted so the clearance between the pushrods and the tappets measure exactly 0.003 in. on all cylinders. See that the carburetor is adjusted to run on a lean mixture with the dash control down, and variations then can be secured by pulling out on

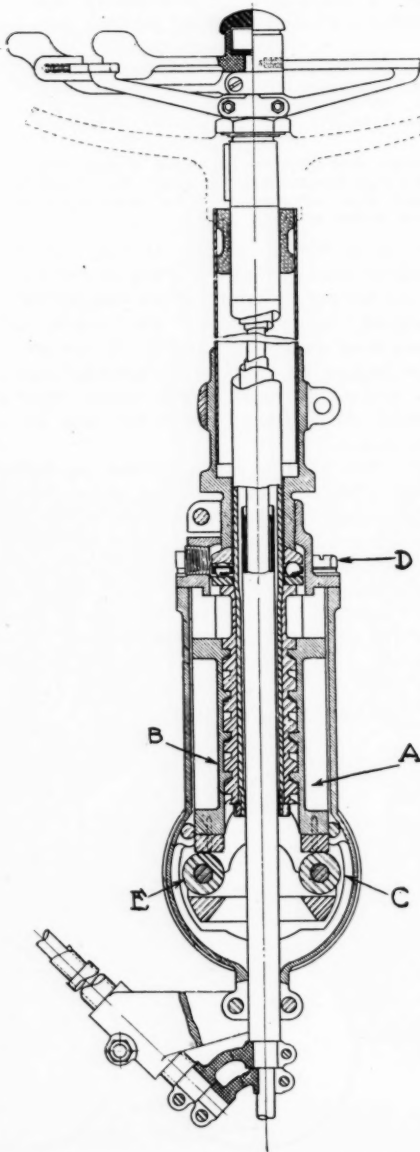


Fig. 3—Jacox steering gear, showing adjustments

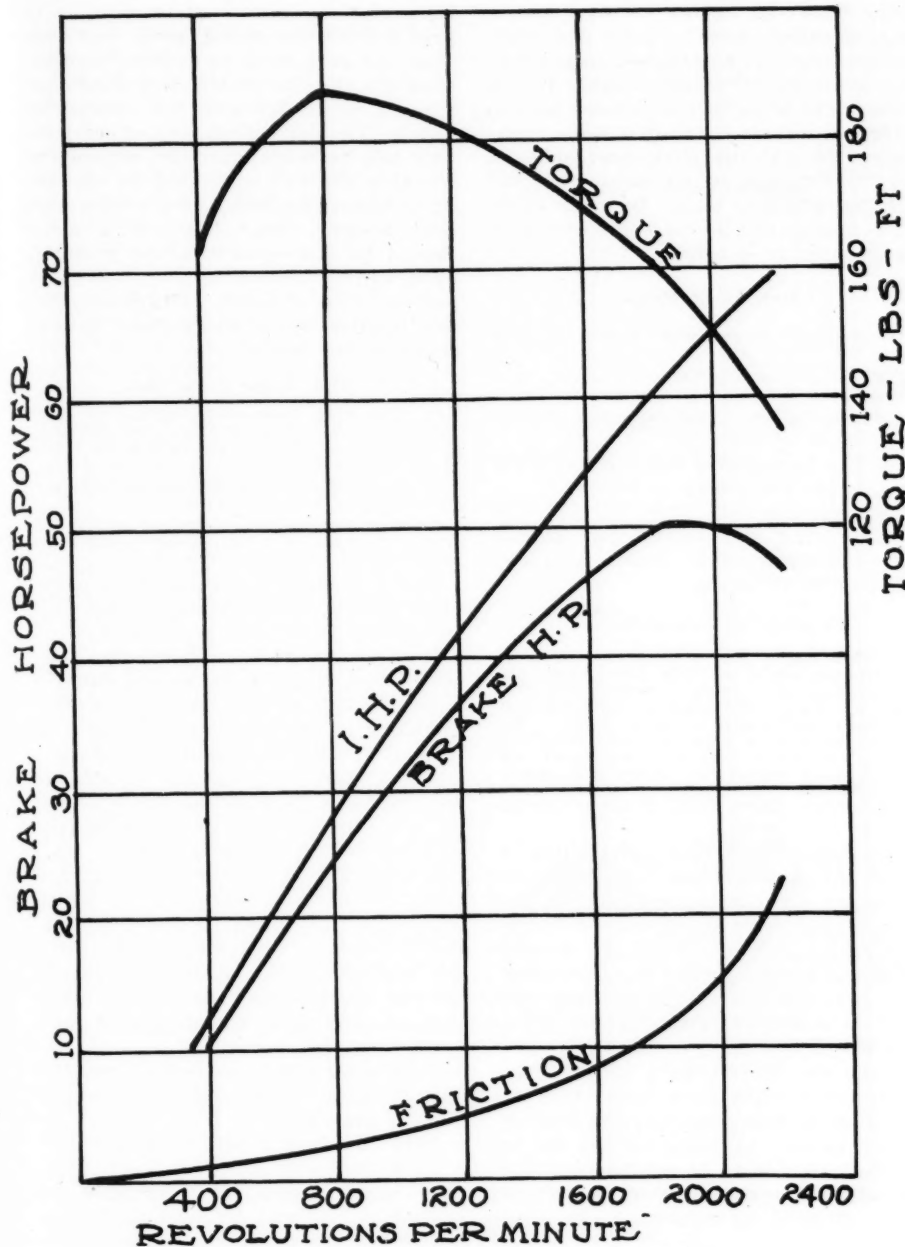


Fig. 4—Horsepower and torque curves of 1919 Paige

the choke. Be sure that the spark plug gap clearances are all the same and set to about 0.030 in. If the exhaust from the engine is smoking persistently, it will be worth while to have the piston rings examined and possibly renewed.

#### Ends Probably Reversed

Q—I operate a railway motor car over a 6-mile line, carrying mail, passengers and express. It was built with a railroad push car and a 4-hp. two-cycle marine engine manufactured by the Gray Motor Co., Detroit. It has a gear pump for circulation attached to the timer shaft. The connection between the engine pulley and pulley on wheel shaft is by 5-in. belt. When the engine is run forward for any length of time as fast as 20 m.p.h. the engine heats excessively, so hot as to stop running. But I have run it 24 miles, running backward at a very high speed, and it showed no sign of heating. I can scarcely run 2 miles forward without heating. What is your opinion of the cause? The same engine when run forward in the motor boat would run all day without heating. Is there any difference in running a two-cycle engine forward or back-

ward? Do you think it is in the pump?—Talmage Wesley, Langford, Ark.

It is our opinion that the backward and forward end of the engine has

become mixed when changing it from the motor boat to the railroad car. We take it that the pump is a water pump. If the pump is made to reverse its direction, of course the engine cooling will not be as effective as it should be. A two-cycle engine will run just as well in one direction as it will in the other.

#### Oil Pump on Chevrolet

Q—Publish illustration of oil pump used on the 1917 Chevrolet 490.

2—Give instructions for adjustment of the Bosch dual magneto and coil.—Roslyn Swank, Sidell, Ill.

1—A diagram showing the oiling system on the Chevrolet is shown in Fig. 5.

2—There is only one adjustment on the Bosch magneto, and this is for the gap at the contacts. With the fibre block resting on the top of the cam the contacts should be separated about 0.01 in. To alter the adjustment the lock-nut must be released first and carefully secured after the adjustment is made. Occasionally expansion of the fiber bushing prevents the free movement of the lever, and in this case the bore of the bushing can be enlarged slightly with a reamer.

#### Cylinder-Lapping Tools

Q—What advantage, if any, would there be in a cylinder-lapping tool made of soft metal instead of wood or iron—tool provided with extension of about 1/8-in?

2—What number of revolutions per minute should tool turn, operated in a press or other form?

3—In refinishing a body after the old paint has been removed, how many coats of paint and varnish are required? Give best process of applying paint and tell how much rubbing is needed to produce glossy finish?

4—Describe an oven for baking enamel on fenders, etc. If expensive, could a suitable oven be made at home?

5—Are there any concerns that completely rebuild cars, selling them so that they have practically the same guarantee as a new car?—H. L. Vanatta, Hunts Spur, Mich.

1—The only advantage gained in using a lapping tool made of lead or some other soft metal is that the tool does not present the possibility of scratching or scoring the cylinder. It has been found from experience that the best and cheapest lapping tool can be made from an old piston.

2—Lapping tools should be driven from 50 to 60 r.p.m.

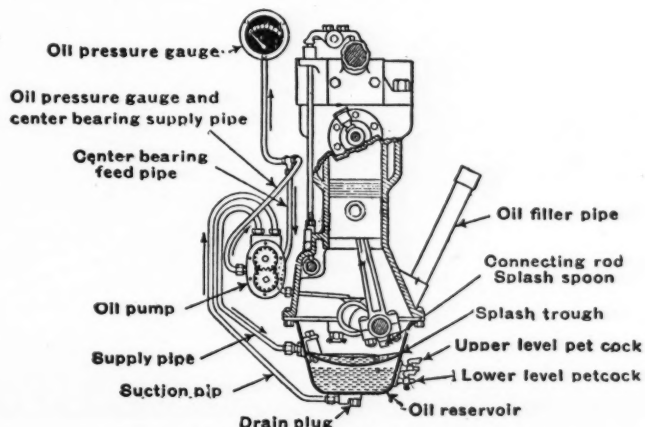


Fig. 5—Oiling system used on 1917 Chevrolet



3—The number of coats of paint and varnish necessary to cover the body depends a great deal upon the material from which the body is made. If the car has an aluminum body, it will take more color varnish to cover than if the car has a sheet steel body. Three coats of good body paint mixed heavy is enough to cover any aluminum job. With a sheet steel body two coats of paint, each rubbed on with a pumice and rotten stone, followed with a coat of color varnish and finally with a coat of good grade coach varnish, is enough to produce a high grade finish.

4—The General Electric Co., Schenectady, N. Y., has a department that builds electrical furnaces and ovens for enamel baking. It is our opinion that money can be saved by purchasing one of these ovens rather than building an oven yourself. Much work is required to build the oven. Besides, it is very difficult to secure the heating units. The large motor car factories generally have electric ovens. Electricity furnishes a reliable means to secure an absolute temperature control, much more reliable in fact than if gas furnaces or oil furnaces are used.

5—We know of no concerns that make it a business of rebuilding cars and selling them under new car guarantees. Several dealers in Chicago overhaul and rebuild their own cars when taken in on trade and sell them with new car guarantees, but we know of no one who makes a general practice of this.

#### Click in Engine

Q—What is the best way or instrument to find the knock in an engine? I have a Ford that has a loud click in it. The bearings are all tight but the pistons are very loose. When the spark is up it is not noticeable very much. It is a 1913 Ford.—R. B. Biggs, River Road Garage, Tiffin, Iowa.

Had you explained something more about the click, as you call it, we could have reasoned the trouble out with more certainty. For example, have you noticed at what period the click occurs? Does the click occur every time the engine revolves or does it occur

every time the engine revolves twice, or at camshaft speed? These and other things should be determined before saying positively what the trouble is. A click might be caused by a loose tappet, a loose camshaft bearing, a worn push-rod guide. If the click approaches a loud knock, then it is possible your engine has a piston slap. In many cases a piston slap can be corrected or a new piston must be fitted.

#### Details of Paige

Q—Publish horsepower curve of the Paige.

2—Give its horsepower curve.

2—How much does it weigh?

3—What is its gasoline mileage?—Edward Dreis, Chicago.

1—The horsepower and torque curves for this car are shown in Fig. 4.

2—Approximately 3400 lb.

3—Judging from experience gained in city driving, this model averages about 12 to 14 m.p.g.

#### Trouble in Gearshifting

Q—This Buick 1915 C-25 gives considerable trouble while shifting from high into intermediate and from intermediate into low. We have tried double clutching, but this does not seem to help much. We do not have any trouble while shifting up, but to shift into a lower gear we have to stop before the gears will mesh. We have had this trouble ever since we had the car.—John Van Costing, Litchville, N. D.

The trouble with your gearshifting is not in the transmission, but is caused we believe by the inexperience of the operator. It must be remembered that when shifting from third to second speed the gears operate at a considerable disadvantage. In order for the gears to slide into place quietly from third speed to second speed it is necessary for the intermediate sliding gear to revolve a little more than twice as fast than it was revolving while still in high speed. In order for the car to travel at 10 m.p.h., in second gear the engine must revolve twice as fast as it would have to revolve if in high gear.

The most practical way to shift from

high gear to intermediate gear is to first depress the clutch pedal and then slide the gear lever to neutral position, then engage the clutch and accelerate the engine rapidly with the accelerator pedal. The correct amount of acceleration can be determined by experience. Roughly the engine should be speeded up to about two times its previous high gear speed. Next the clutch pedal should be depressed and the gearshift lever can be moved into second speed without a bit of noise. The same practice applies when going from second speed to first speed.

#### High Gear Slips Out

Q—The high gear of a Stutz 1918 slips out when I am running along and suddenly take my foot off the accelerator to coast. What causes this?

2—Show diagram of Stutz rear axle and transmission with adjustments?

3—Show necessary adjusting points on steering gear of this model?—Lawrence Stauthammer, Green Valley, Ill.

1—Fig. 6 shows a phantom view of the Stutz gearset. When driving in high gear the two gears A and B are locked together by the clutch. Either the jaws of the clutch are worn or the shifting yoke C is out of adjustment. The adjustment of the shifting yoke is controlled by the high and intermediate lever D, which is on the outside of the gear case. Loosen the clamp screws on the shifting yoke by removing the plug on the top of the gearcase. This will enable you to turn the shifting screw about three-quarters turn, which will assist the gears to stay in mesh. The tube can be turned by using a Stillson wrench. This adjustment should remedy the trouble, but in the event that it does not, the following new parts must be secured:

5414 main drive gear with stem, 20T

4421 main high and intermediate gear, 26T

4445 interlocker ball, 7/16 in.

4446 interlocking spring

2—Fig. 6 shows the rear axle adjustments. It will be seen that there is notched collar at each side of the ring gear carrier. This affords an easy adjustment of the ring gear. By loosening the small retaining lugs holding the adjusting collar, it is possible to turn this collar either toward or away from the ring gear. It must be remembered there are two of these collars, one on each side of the ring gear. To move the ring gear closer into the pinion, the collar on the right side should be backed off a few notches and the collar on the left side moved up to it the same number of notches. A play of 0.006 to 0.008 in. is the recommended clearance to allow for the tooth tolerance.

3—The Gemmer steering gear is employed on this model, Fig. 8. There are two adjustments which will take up the wear if the gears are not worn too much. The end play in the cross-shaft is taken up by adjusting the small nut marked I. The locknut should be loosened and the screw tightened until a perceptible effort is required to turn it farther. The locknut should be

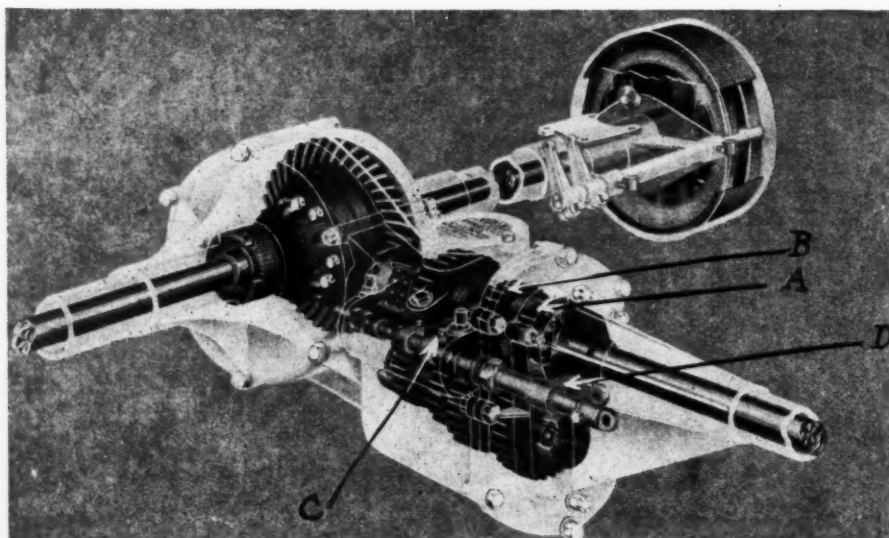


Fig. 6—Stutz gearset, showing adjustments for same

tightened then, holding the screw in the same position.

The second adjustment is made by loosening the clamping collar B and tightening the adjustment collar H. Ordinarily these two adjustments will remove any wear. However, if the wear has been neglected and has reached the point where these adjustments will not remove the trouble, then the arm J should be removed from the cross shaft. The steering wheel should be turned around so the cross shaft will have turned one-quarter turn. The gears in this position will be mating in a new position which heretofore has been in mesh only when turning very sharp corners, so the gears are worn very little in this position. The drop arm should be secured in this new position.

#### Reader Gives Experience

Mason City, Iowa, Editor Motor Age—Referring to the trouble experienced by subscriber, published in issue of August 14, concerning howling of gears, I had exactly the same trouble with my car. There was a fierce howling at 15 to 17 m.p.h. I probably spent \$300 trying to find remedy, with no result.

Finally we took the ring gear off the differential spider, and found on very close examination that the bolts holding the ring gear in place had been stretched or sprung a very little. Old bolts were held in place with nuts. Threw away old bolts, put in new bolts, hot-riveted, and every trace of noise disappeared.—F. M. Morris.

#### Correcting Specification Misprint

Q—In your July 17 issue on page 53 under "Pneumatic Tires and Rims for Cars and Commercial Vehicles" the oversize tire for a nominal 33 by 4 in. is given as 32 by 4½. Should not the correct oversize be 34 by 4½?—R. W. Buhrmaster, Chicago.

Yes, 34 by 4½ in. is correct.

#### Why Gears Stick

Q—What causes the gears on a 1919 model 4-24 Briscoe to stick? There are times when it works nicely. It shifts into low and high but sticks in second.—J. H. Quick, Boulder, Ill.

The most probable cause of this sticking action when shifting from intermediate position is likely to be found in the gearshifter lock or the gear-

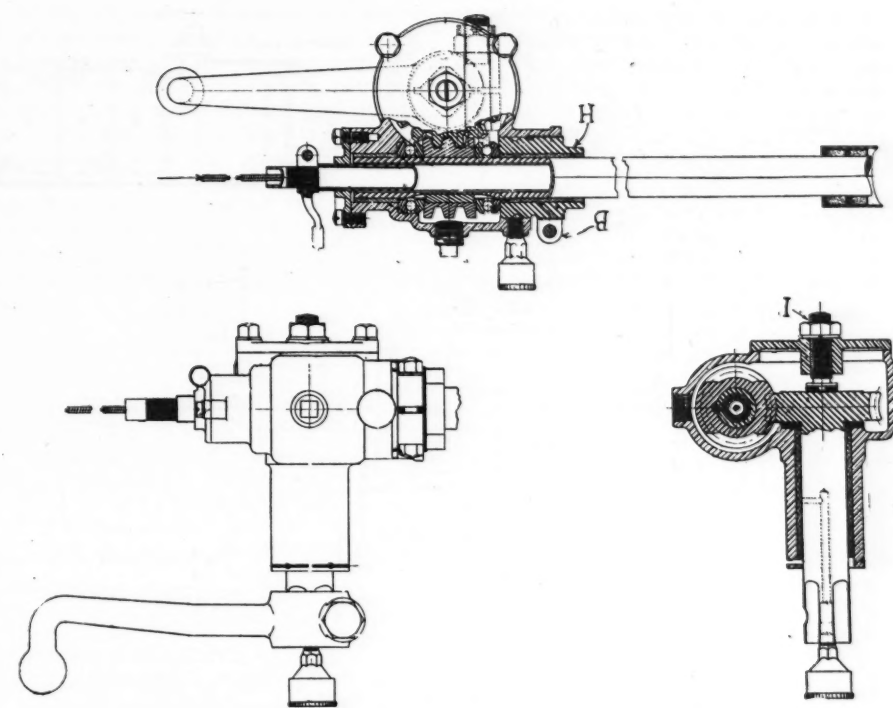


Fig. 8—Gemmer steering gear, showing adjustments

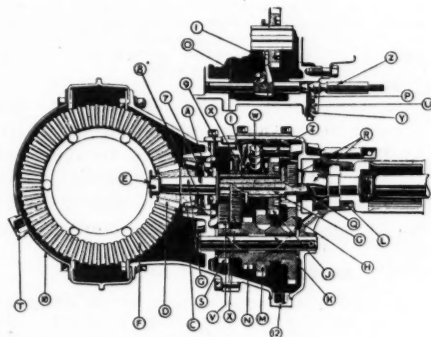


Fig. 9—Briscoe gearset, showing adjustments

shifter rod. There is a possibility the gearshifter rod marked Z, Fig. 9, is bent or else the slotted grooves in the rod have become worn. It is also probable that the shifter fork itself, 1, has become bent. If this is the case, the trouble can be remedied by undoing the clevis bolt secured to the shifting rod Z and then loosening the set screw which

holds the shifter for O to the shifter rod.

The shifter fork then should be held from turning and the rod Z turned in or toward the rear axle about two complete turns. The clevis then should be re-connected and the shifting tried out. If it is found that this has not remedied the trouble, then remove the small plug Y, the spring U and the rod lock P. It is possible this lock has become worn and allows the shifter rod to stick.

#### Parts for Alter Car

Q—Where can I get parts for the Alter car?

2—How long was the company in business?—H. D. James, Detroit, Mich.

1—You can obtain parts from the Puritan Machine Co., Detroit.

2—This company was in production one year.

#### Kerosene and Cooling

Q—What would the results be if plain kerosene oil were used in the cooling system in the winter time instead of water?—George P. Eldam, Hazleton, Pa.

The degree of cooling obtained from a cooling medium is dependent upon the specific heat of the medium itself. The amount of heat necessary to raise a pound of water 1 deg. Fahr. is 1 B. t.u. The specific heat of kerosene is 0.47, meaning that it takes 47 per cent as much heat to raise a pound of kerosene as compared with a pound of water. While it is true the kerosene will give up its heat just that much more rapidly than water, it is a fact nevertheless that for the same amount of cooling a larger amount of kerosene must be used. There is another consideration when using kerosene for cooling. Kerosene has a boiling point that varies between 158 and 220 deg. This means an engine will boil the cooling liquid away much more rapidly if the boiling point of the liquid is low. Most engines operate at a temperature

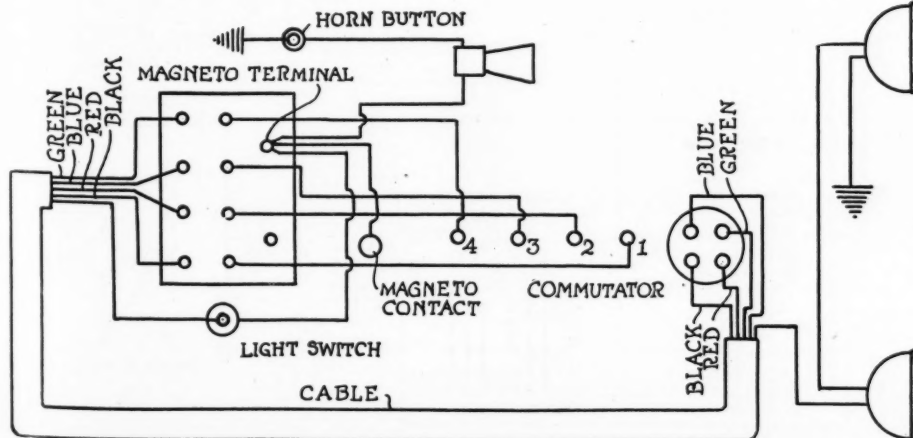


Fig. 7—Wiring diagram of the Ford car



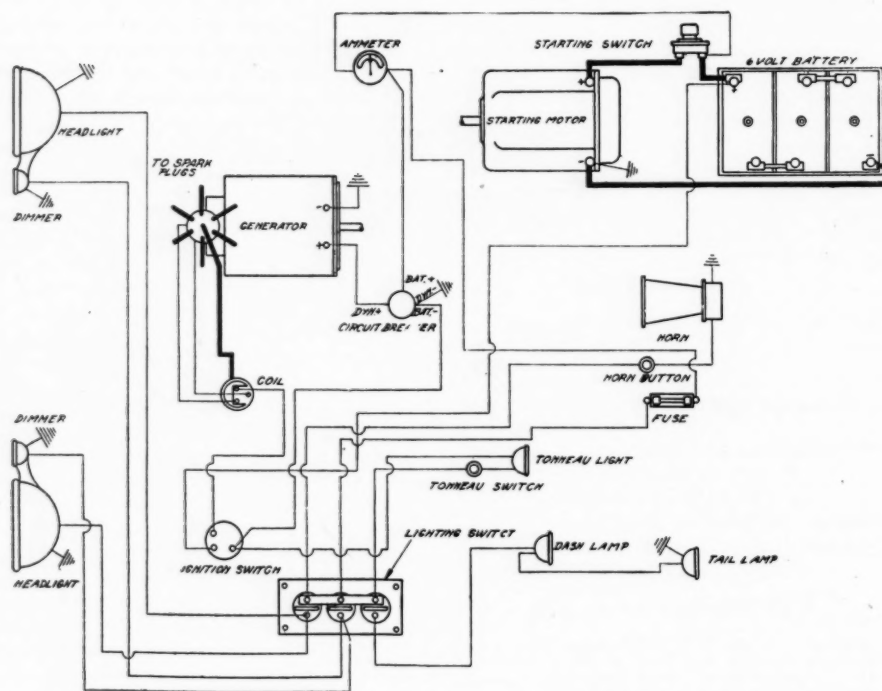


Fig. 10—Wiring diagram of Empire 60 roadster

about 180 deg. This temperature is hot enough to boil away any good grade of kerosene, but the poor grade will remain in liquid form.

## The Electric System

### Wiring of Empire Roadster

Q—Publish wiring diagram of model 60 Empire roadster.—W. E. Farrar, Flint, Mich.

The diagram for this car is shown in Fig. 10.

### Wiring of Bosch Magneto

Q—Publish wiring diagram of a Dixie high-tension magneto with battery connections to crank off of.

2—What is the advantage of the large inlet valve and small exhaust valve on the new Buick?—A. J. Carter, Electra, Tex.

1—The Dixie magneto is shown in Fig. 12. This is a high-tension magneto and does not deliver current for battery charging.

2—This construction on the Buick is designed to increase the volumetric efficiency of the engine. The larger valve permits the intake gases to be drawn into the cylinder more easily, and since the difference between the intake pressure and atmospheric pressure is only about 2 or 3 lb., any attempt such as this certainly will produce better engine operation.

### Ford Wiring Diagram

Q—Publish wiring diagram for Ford car.—J. L. Carter, Temple, Tex.

This is shown in Fig. 7.

### Battery Connections Reversed

Q—I have a 17 model Dodge with North-east lighting and starting system. The battery indicator sometimes registers charge, and again it registers discharge. The car may be running along very nicely and all at once the gage will reverse and may stay in the reversed position for a day, maybe longer and maybe less. The indicator shows discharge when the car is running, say, 8 m.p.h. or more. When

the car goes very much slower it will show charge and vice versa but under all conditions when the car is stopped and switch of the indicator shows off.—E. H. Craver, Green River, Wyo.

A case very much similar to this one came to our attention recently. At first it was thought the trouble was due to an improperly adjusted relay, it never occurring that the battery might be reversed in its connections.

### Adjusting Remy Generator

Q—Can the Remy generator be adjusted so as to charge the battery more? If not, how can it be cleaned? At present, with lights on a speed of 300 m.p.h. must be attained before ammeter shows charge.—W. Allen McDowell, Uniontown, Pa.

The diagram for the Sun car is shown in Fig. 11. The trouble no doubt will be found in the voltage regulator. The internal connections of

the regulator are shown in the illustrations. If it is found that all wires on the car agree with the wiring connections as shown in the illustration, then examine the contact points of the regulator as shown in Fig. 13. The small nut shown in the Fig. 13 controls the adjustment of the regulator.

This should increase the charge rate however. There is a possibility that there will be no increase noticed. In this event you will find undoubtedly that the mica between the segments on the commutator is higher than the copper itself. The armature should be removed from the generator and the mica undercut with a small hacksaw blade or a thin file.

### Charging Rate Too Low

Q—I am having trouble with a battery running down very often on a new Crow-Elkhart roadster. The electrician set the generator to charge as much as possible, and it now shows about 10 amp. at 18 m.p.h., but when I turn the lights very much the battery soon runs down. It is a Willard battery not over four months old. What would you suggest?

2—If there should happen to be a short in the wires, how could I find it?—Everett Darnell, West Helena, Ark.

1—Ten amperes is not enough charging to keep the battery in condition. Your generator can be adjusted to deliver 13 amp., which is the maximum when the generator is hot, and when it is cold this will increase to 15 amp. This car has a third-brush regulation, and this can be increased by moving the third brush over in the direction of rotation.

2—First you should determine if there is a short-circuit in the wires. This can be determined by loosening the terminals on the battery and testing for a spark, which will appear if there is a short in the circuit.

## Carburetion

### Sweating of Carbureter

Q—What causes the Marvel carburetor on the Oakland 6-34B to sweat? Is it the nature of the carburetor? If not, tell how to stop this.—Jesse P. White, Jr., Lexington, Ala.

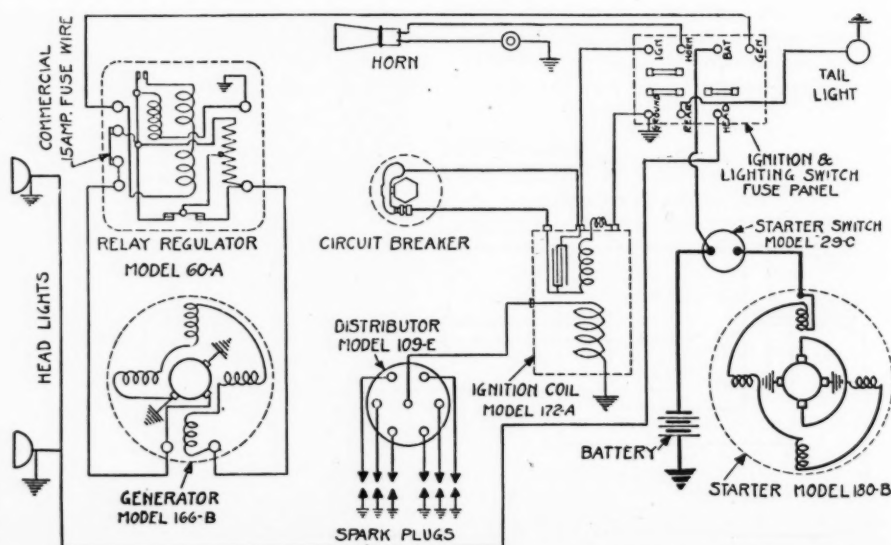


Fig. 11—Wiring diagram of Remy system on Sun car

This constant dripping action is due in a large measure to the capillary attraction between the rust proofing and filler material on the inside surface of the carburetor and the liquid. Many carburetor makers finish the inside of the carburetor with a material that fills the pores in the metal. It has been found that cast metals are not impervious to the passage of gasoline. To overcome this objection this filler material is applied. While overcoming the first objection, this introduces another feature which, while objectionable, does not allow as much gasoline to pass as the former condition. We have never heard of anyone successfully overcoming this sweating action.

#### This Ford Runs Fast

Q—I have had a new 1919 Ford touring car for about six weeks. It will not throttle lower than 11 m.p.h. Suggest a remedy.—A. E. Detweiler, Cleveland, Ohio.

Several things might be causing this trouble. The carburetor might be out of adjustment or the intake manifold might be loose on the engine casting, causing air leaks which make it necessary to run at higher speeds, or the spring in the timer might be weak.

#### Must Use Heat

Q—Is it possible to use a Rayfield model G water jacket-type carburetor on a Paige and not connect the water jacket?

2—Will it operate in winter without a hot-air pipe?

3—Instruct how to stop carburetor from leaking.—F. G. Phelps, East Carondelet, Ill.

1—The engine no doubt can be made to run without fitting the carburetor with waterjackets and hot-air stoves, but the practice is not recommended. Low-grade fuel must have heat applied to burn it successfully.

2—By all means use a hot-air stove in winter time. Your engine may start and run successfully in cold weather, but the continued operation without injury and excessive expense is doubted. For example, in starting the engine temperature rises very slowly and until the heat of the engine is enough to volatilize the heaviest of the gasoline distillates this fraction will accumulate in the cylinders. This causes crankcase dilution regardless of how tight the rings fit.

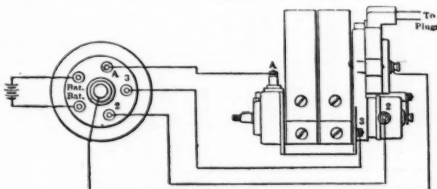


Fig. 12—Wiring of Dixie magneto

#### RELAY REGULATOR. REGULATOR CONTACT POINTS

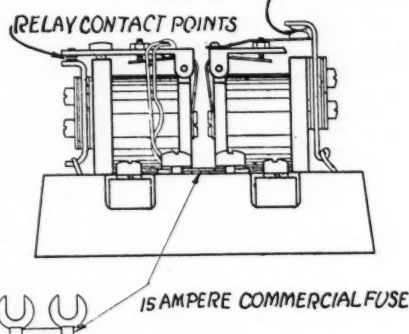


Fig. 13—Remy regulator, showing adjustments

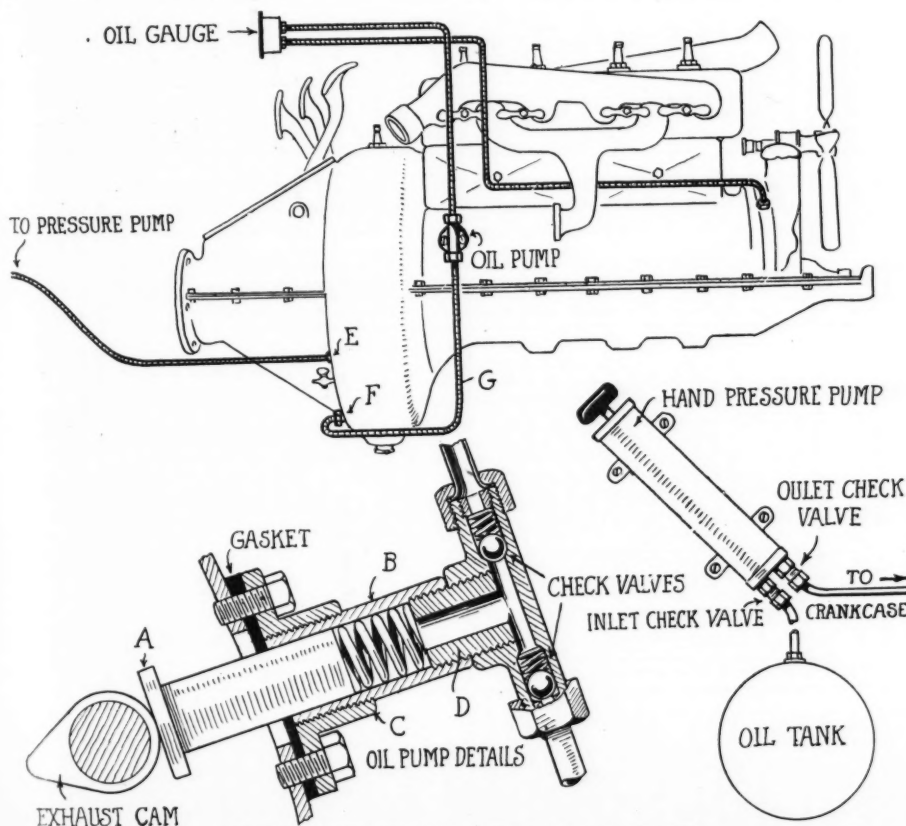


Fig. 14—Pressure oiling system for rebuilt Ford

3—Where does your carburetor leak? Does it appear as if the fuel is coming from the float chamber or from the nozzle chamber? Do any of the gasoline connections leak? The first thing to do is to see that all the valves are perfectly tight. A slight bit of sediment often will cause a carburetor to flood. A carburetion engineer in Chicago recently after extensive experiments decided that much of the carburetor leakage is due to the capillary attraction between the surface of the metal and the fuel and that it cannot be overcome very readily unless some coating is applied to the metal to counteract this attraction.

#### Setting Hudson Carburetor

Lake City, Iowa, Editor, MOTOR AGE—In the July 24 number of MOTOR AGE I saw a question from a reader at Illiopolis, Ill., pertaining to his Hudson car. Having had the same trouble with a Hudson, I cleaned the carburetor as the instructions said but finding this did not help any, decided the carburetor was not vaporizing the gasoline as it should.

In the small rod that runs from the piston is a slot which becomes wider the higher the piston goes, which allows more gasoline to be carbureted. I find that when this slot is on the back side of the carburetor the air will not strike the gasoline as it comes into the chamber, therefore, about half to three-fourths of the gasoline is sucked into the cylinder as a liquid instead of a vapor.

If the piston is turned so the slot is to the outside, the air will strike the gasoline and fully vaporize it.

Probably some inexperienced mechanics had put it back so the slot was turned wrong. Since I changed the piston around I have not had a bit of trouble.—Earl Short.

## Rebuilding

#### Ford Rebuilt for Speed

Q—In rebuilding a Ford into a speedster for fast but not racing purposes, what speed could I expect of a Ford equipped with roof over-head valves, Bosch magneto, Miller 1½-in. carburetor, 3 to 1 gear ratio, lightweight pistons and rods and 30 by 3½-in. tires?

2—Where is the Miller carburetor made?

3—What model Bosch magneto should I use on a car like this?

4—Would it be practical to install a vacuum system on the car?

5—What kind of oiling system should be used?—John Rensberger, South Bend, Ind.

1—A Ford, rebuilt and having almost the identical equipment yours is going to have, recently was described in Motor Age. This car had a set of gears having a ratio of 2¾ to 1. Your car with a 3 to 1 set of gears will make approximately 75 m.p.h.

2—The Miller carburetor is made by the Harry A. Miller Mfg. Co., Los Angeles, Cal.

3—Either the Bosch DU-4 or the ZR-4 can be used for this car.

4—Yes, it will be more practical than to install a pressure feed system.

5—A pressure oiling system should be used as is shown in Fig. 14.



# Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only—These tables are revised and brought up to date monthly

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carburetor	Fuel Feed	Clutch	Gearset	Universal	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Allen 43.....	5	\$1250	110	32x4	Miller	3 1/2x5	G.B. & S	4	19.6	1-Stron.	Vacuum	B. and B.	Own	Detroit	Columbia	Ditweiler	Stewart	Firestone	6-3	90	Prest.	A-L	A-L	Conn.	-8	Allen 43.
American B.....	5	1765	122	32x4	Firestone	3 1/2x5	Ruten.	6	23.44	1-Zen.	Vacuum	B. and B.	G-L	Hart	Salisbury	Gemmer	V. Sicken	Firestone	6	80	Col.	West.	West.	A-K.	6	American B.
American Beauty.....	5	2000	121	32x4	Firestone	3 1/2x5	Cont.	6	25.35	1 1/2-Ray.	Vacuum	B. and B.	Warner	Acme	Timken	Warner	Warner	Firestone	6	100	Willard	West.	West.	A-K.	6	American Beauty.
Anderson 8-20.....	7	2625	120	32x4	Federal	3 1/2x5	Cont.	8	25.35	1-Zen.	Vacuum	B. and B.	Durston	Arvac	Col.	Jacob	Warner	Firestone	6	80	Willard	West.	West.	Conn.	6	Anderson 8-20.
Apperson Anniversary.....	7	4000	130	32x4	optional	3 1/2x5	Own	8	33.80	John.	Vacuum	B. and B.	G-L	Hart.	Own	Own	V. Sicken	Firestone	6	90	Willard	Bijur	Remy	Conn.	6	Apperson Anniversary.
Auburn 6-30-H.....	5	1605	120	32x4	Goodrich	3 1/2x5	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	G-L	Spicer	Col.	Jacob	Warner	Firestone	6	80	Willard	Remy	Remy	Delco	6	Auburn 6-30-H.
Austin 12.....	6	4230	142	34x4	Goodrich	27x5	Weid.	12	39.68	1 1/2-Stron.	Vacuum	Muncie	Muncie	Spicer	Austin	Lavine	Warner	Firestone	6	120	Willard	Delco	Delco	Delco	6	Austin 12.
Biddle H.....	4	2750	121	32x4	Firestone	3 1/2x5	Buda	4	22.50	1 1/2-Zen.	Vacuum	Warner	Warner	Spicer	American	Gemmer	Warner	Firestone	6	90	Willard	G. & D.	G. & D.	Eise.	6	Biddle H.
Bour-Davis, 20.....	5	1595	118	32x4	Goodyear	3 1/2x5	Cont.	6	25.35	1-Stron.	Vacuum	B. and B.	Muncie	Mechanics	Salisbury	C. A. S.	Stewart	Firestone	6	115	Willard	Remy	Remy	U. S. L.	6	Bour-Davis, 20.
Brewster.....	5	6900	125	34x4	Kelly-S.	4 x5 1/2	Own	4	25.60	Zen.	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	80	U. S. L.	U. S. L.	U. S. L.	Bosch	6	Brewster
Briscoe 4-24.....	5	885	104	30x3	optional	3 1/2x5	Own	4	16.9	1-Buick	Gravity	Own	Own	Own	Own	Own	Stewart	Firestone	6	80	Prest.	A-L	A-L	Conn.	6	Briscoe 4-24.
Buick 4-45.....	5	1495	118	32x4	Goodyear	3 1/2x5	Own	6	27.34	Mar.	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	60	U. S. L.	Delco	Delco	Delco	6	Buick 4-45.
Buick H-49.....	7	1785	124	34x4	Goodyear	3 1/2x5	Own	6	27.34	Mar.	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	60	U. S. L.	Delco	Delco	Delco	6	Buick H-49.
Cadillac 57.....	7	3320	125	35x5	optional	3 1/2x5	Own	8	31.25	1 1/2-Ray.	Pressure	Own	Own	Spicer	C-Tink.	Own	V. Sicken	Kelsey	6	Exide	Exide	Delco	Delco	Delco	6-3	Cadillac 57.
Campbell C-4.....	5	850	110	30x3	optional	3 1/2x5	Own	4	24.03	Sund.	Vacuum	Muncie	Own	Own	Salisbury	Own	V. Sicken	Firestone	6	117	Willard	A-L	Own	A-K.	6	Campbell C-4.
Case U.....	7	125	125	32x4	Goodyear	3 1/2x5	Cont.	6	29.40	1 1/2-Ray.	Vacuum	B. and B.	G-L	Stanwell	Col.	Jacob	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Case U.
Chalmers 35-C.....	5	1685	117	32x4	optional	3 1/2x5	Cont.	6	25.35	1 1/2-Ray.	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	7	1865	122	34x4	optional	3 1/2x5	Own	6	25.35	1 1/2-Ray.	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	100	Prest.	West.	West.	West.	6	Chalmers 35-C.
Chalmers 35-C.....	5	1116	116	33x4	Goodrich	3 1/2x5	Own	6	23.4	1-Carter	Vacuum	O														

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H.P.	Carburetor Make and Size	Fuel Feed	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model	
Gerritson.....	5	1550/122	32x4	Goodyear	32x4	3 1/2x5	Ruten.	6	23.44	1-Strum.	Vacuum	B. and B.	G-L.	Hart.	W-Weiss	C. A. S.	Stewart	Firestone	6	88	Willard	Dyn.	Dyn.	Delco	6	Gerritson.	
Glile 6-40.....	5	1655/119	32x4	Goodyear	32x4	3 1/2x5	Ruten.	6	23.44	1-Strum.	Vacuum	Ovn	Ovn	Spicer	American	Delco	Stewart	Goodyear	6	80	Willard	West.	West.	Delco	6	Glile 6-40.	
Grant.....	5	1120/114	32x3 1/2	.....	.....	3 1/2x4 1/2	.....	6	21.60	1-Strum.	Vacuum	Duranton	Duranton	Mechanics	Penn	Jacox	V. Sticklen	Stanwell	6	90	Willard	Wagner	Wagner	Remy	6	Grant.	
Hanson.....	5	1685/119	32x4	.....	.....	3 1/2x4 1/2	Cont.	6	25.35	Strum.	Vacuum	B. and B.	Covert	Detroit	Timken	Gemmer	Stewart	Keley	6	80	Willard	A-L.	A-L.	Remy	6-3	Hanson.	
Harron.....	5	905/106	30x3 1/2	.....	.....	3 1/2x5 1/2	Cont.	4	16.90	1-Strum.	Vacuum	B. and B.	Mechanics	Own	Adams	Gemmer	Stewart	Stanwell	6	80	Willard	Remy	Remy	A-K.	6-3	Harron.	
Hartford 4-20.....	2	880/100	28x3	.....	.....	3 1/2x4 1/2	Cont.	4	14.40	1 1/2-Zen.	Gravity	.....	.....	Blood	Barnes	Barnes	.....	.....	6	100	National	Wagner	Wagner	A-K.	6-3	Hartford 4-20.	
Hatfield A.....	5	1180/115	32x4	Firestone	32x4	3 1/2x4 1/2	G. B. & S.	4	22.50	1-Zen.	Vacuum	G. B. & S.	G-L	Spicer	Penn	Barnes	.....	.....	6	100	National	Dyn.	Dyn.	Conn.	6	Hatfield A.	
Haynes 46.....	7	3230/127	32x4 1/2	optimal	2 1/2x5 1/2	2 1/2x5 1/2	Ovn	12	36.30	1 1/2-Ray.	Vacuum	B. and B.	Ovn	Arvae.	Ovn	Jacox	Stewart	Houk	6	125	Willard	L-N.	L-N.	Delco	6	Haynes 46.	
Haynes 45.....	7	2485/116	32x4 1/2	optimal	3 1/2x5 1/2	3 1/2x5 1/2	Cont.	6	29.40	1 1/2-Ray.	Vacuum	B. and B.	Ovn	Arvae.	Ovn	Jacox	Stewart	Firestone	6	125	Willard	L-N.	L-N.	Ki-Rem	6	Haynes 45.	
Holmes 206.....	5	1785/116	32x4	Goodyear	32x4	3 1/2x4 1/2	Cont.	6	25.35	1-Sher.	Vacuum	Ovn	Ovn	Ovn	Ovn	Gemmer	Stewart	Firestone	6	100	U. S. L.	Apello	Apello	Remy	6	Holmes 206.	
Hudson O.....	7	2100/125	32x4 1/2	optimal	3 1/2x5 1/2	3 1/2x5 1/2	Ovn	6	29.40	1 1/2-Newc.	Vacuum	B-L	B-L	Spicer	Timk.	Gemmer	V. S. Elgin	.....	12	100	Col.	Dyn.	Dyn.	Else.	12-6	Holmes.	
Hupmobile R.....	5	1450/112	32x4	Goodyear	32x4 1/2	3 1/2x5 1/2	Ovn	4	16.90	1-Strum.	Vacuum	Ovn	Ovn	Detroit	Timken	Jacox	Stewart	Keley	6	87 1/2	Willard	Delco	Delco	A-K.	6	Hudson O.	
Jones.....	7	2250/126	32x4	Goodrich	32x5 1/2	3 1/2x5 1/2	Cont.	6	29.40	1 1/2-Ray.	Vacuum	B. and B.	B-L	Arvae	Timken	Warner	Stewart	Firestone	6	120	Pres.	West.	West.	Remy	6	Jones.	
Jordan.....	7	2475/127	32x4 1/2	Goodyear	32x5 1/2	3 1/2x5 1/2	Cont.	6	29.40	1 1/2-Strum.	Vacuum	B. and B.	Detroit	Sterling	Timken	Gemmer	V. Sticklen	Firestone	6	100.8	Willard	Biur	Biur	Delco	6	Jordan.	
King G.....	7	2230/120	32x4	Firestone	32x5	3x5	Ovn	8	28.80	1 1/2-Ball	Vacuum	B. and B.	Ovn	Spicer	Col.	Jacox	Stewart	Stanwell	6	117.5	Willard	Biur	Biur	A-K.	6	King G.	
Kiesel.....	5-7	2750/124	32x4 1/2	Goodyear	32x5 1/2	3 1/2x5 1/2	Ovn	6	26.30	1 1/2-Strum.	Vacuum	Warner	Warner	Spicer	Ovn	Jacox	Stewart	.....	6	90	Willard	Remy	Remy	Remy	6	Kiesel.	
Kline Kar 6-42.....	7	1865/121	32x4	Goodyear	32x4 1/2	3 1/2x4 1/2	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	G-L	.....	Hess	Wohlbart	Stewart	Firestone	6	90	Pres.	West.	West.	Conn.	6	Kline Kar 6-42.	
Lexington R-19.....	5-7	1785/122	32x4	Goodyear	32x4 1/2	3 1/2x4 1/2	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	Warner	Hardy	Hess	Warner	Stewart	Goodrich	6	100	Willard	West.	West.	Conn.	6	Lexington R-19.	
Liberty 10-B.....	5	1570/115	32x4	Goodyear	32x4 1/2	3 1/2x4 1/2	Cont.	6	25.35	1-Strum.	Vacuum	B. and B.	Detroit	Spicer	Timken	Gemmer	Stewart	Firestone	6	88	Willard	Wagner	Wagner	A-K.	6	Liberty 10-B.	
Loocomobile 48.....	7	8100/142	35x5	.....	.....	4 1/2x5 1/2	Ovn	6	48.60	Ovn	Pressure	Ovn	Ovn	Own	Timken	Ovn	Stewart	Firestone	6	120	Willard	West.	West.	Bert.	6	Loocomobile 48.	
Mathison B.....	5	1305/116	32x3 1/2	optimal	3 1/2x4 1/2	3 1/2x4 1/2	Falla	6	23.44	1-Strum.	Vacuum	B. and B.	Mechanics	Penn	Jacox	Gemmer	Stewart	Stanwell	6	94	Willard	Wagner	Wagner	A-K.	6	Mathison B.	
Marmon 34.....	7	3860/136	32x4 1/2	.....	.....	3 1/2x5 1/2	Ovn	6	33.75	Strum.	Gravity	Ovn	Ovn	Spicer	Ovn	Gemmer	Stewart	V. Sticklen	.....	6	120	Pres.	Biur	Biur	Bosch	6	Marmon 34.
Maxwell 25.....	5	985/109	30x3 1/2	U. S.	.....	3 1/2x4 1/2	Ovn	4	21.03	1-John.	Vacuum	Ovn	Ovn	Own	Ovn	Gemmer	Stewart	Jackson	.....	12	35	Pres.	S-H.	S-H.	A-K.	12	Maxwell 25.
McFarlan 127.....	7	4300/136	35x5	optimal	4 1/2x6	T-McF.	Ovn	6	48.60	1-John.	Vacuum	B. and B.	B-L	Spicer	Timken	Gemmer	Stewart	Firestone	6	117	Willard	West.	West.	Bos. W.	6	McFarlan 127.	
Merced Series 4.....	6	4500/132	32x4 1/2	optimal	3 1/2x5 1/2	3 1/2x5 1/2	Ovn	4	22.50	1 1/2-Ball	Vacuum	Ovn	Ovn	Spicer	Ovn	Gemmer	Stewart	Firestone	6	120	Willard	West.	West.	Bert.	6	Merced Series 4.	
Mitchell E-40.....	5	1675/120	32x4	U. S.	.....	3 1/2x5	Ovn	4	22.50	1 1/2-Ray.	Vacuum	B. and B.	Ovn	Spicer	Ovn	Gemmer	Stewart	Stanwell	6	100	Willard	Remy	Remy	Remy	6	Mitchell E-40.	
Moine-Knight L.....	5	2000/118	32x4	optimal	3 1/2x5	3 1/2x5	Ovn	4	22.50	1 1/2-Schab.	Vacuum	B. and B.	Warner	Spicer	Timken	Jacox	Stewart	Firestone	6	117	Willard	Wagner	Wagner	A-L.	6	Moine-Knight L.	
Monitor, M. & O.....	5	1575/117	32x4	Miller	32x4 1/2	3 1/2x4 1/2	Cont.	6	25.35	1-Strum.	Vacuum	B. and B.	G-L	.....	Stanwell	C. A. S.	Stewart	Stanwell	6	110	Pres.	Dyn.	Dyn.	Conn.	6	Monitor, M. & O.	
Moore 6-66.....	5	1785/118	32x4	Miller	32x4 1/2	3 1/2x4 1/2	Cont.	6	25.35	1-Tillot.	Gravity	B. and B.	B-L	Spicer	Timken	Warner	Stewart	V. Sticklen	6	110	Exide	Delco	Delco	Delco	6	Moore 6-66.	
Moore 30.....	5	995/106	30x3 1/2	Firestone	32x4 1/2	G. B. & S.	Cont.	4	22.50	1-Mar.	Vacuum	B. and B.	G-L	U. P.	Penn	Diveiler	Stewart	Firestone	6	80	Willard	A-L.	A-L.	Conn.	6	Moore 30.	
Nash 51.....	5	1490/121	33x4	optimal	3 1/2x5	3 1/2x5	Ovn	6	25.35	1 1/2-Mar.	Vacuum	B. and B.	Ovn	Own	Ovn	Gemmer	Stewart	Firestone	6	100	Willard	Delco	Delco	Delco	6	Nash 51.	
Nash 51.....	7	1640/127	33x4 1/2	optimal	3 1/2x5	3 1/2x5	Ovn	6	25.35	1 1/2-Mar.	Vacuum	B. and B.	Ovn	Own	Ovn	Gemmer	Stewart	Firestone	6	100	Willard	Delco	Delco	Delco	6	Nash 51.	
Nash 51.....	7	2450/128	33x4 1/2	optimal	3 1/2x5 1/2	3 1/2x5 1/2	Cont.	6	29.40	1 1/2-Ray.	Vacuum	Ovn	Ovn	Spicer	Col.	Warner	Stewart	Firestone	6	110	Pres.	West.	West.	Delco	6	Nash 51.	
National 12.....	7	3050/123	33x4 1/2	optimal	2 1/2x4 1/2	2 1/2x4 1/2	Ovn	12	39.68	1 1/2-Ray.	Vacuum	Ovn	Ovn	Spicer	Col.	Warner	Stewart	Firestone	6	110	Pres.	Biur	Biur	Delco	6	National 12.	
Nelson.....	5	1500/104	32x4	Goodyear	32x4 1/2	3 1/2x4 1/2	Ovn	4	15.63	1-Zenith	Vacuum	Ovn	Ovn	Own	Ovn	Ovn	Stewart	Keley	12	72	Willard	U. S. L.	U. S. L.	Bosch	12	Nelson.	
Oakland 34-B.....	5	1075/112	32x4	Goodyear	2 1/2x4 1/2	2 1/2x4 1/2	Ovn	6	18.90	1-Mar.	Vacuum	North.	Warner	Mechanics	West-Mott	Jacox	Stewart	Pertman	6	85	Pres.	Remy	Remy	Remy	6	Oakland 34-B.	
Oakland 37-A.....	5	1305/112	32x4	Goodyear	2 1/2x4 1/2	2 1/2x4 1/2	North.	6	18.90	1 1/2-John.	Vacuum	North.	Warner	.....	West-Mott	Jacox	Stewart	Pertman	6	80	U. S. L.	Remy	Remy	Remy	6	Oakland 37-A.	
Oakland 45-B.....	7	1875/120	32x4 1/2	Goodyear	2 1/2x4 1/2	2 1/2x4 1/2	Ovn	8	26.40	1 1/2-Ball	Vacuum	Ovn	North.	.....	West-Mott	Jacox	Stewart	Pertman	6	100	Exide	Delco	Delco	Delco	6	Oakland 45-B.	
Olympian 45.....	5	1240/112	32x3 1/2	Miller	32x4 1/2	3 1/2x4 1/2	Ovn	4	16.90	1 1/2-Strum.	Vacuum	B. and B.	Ovn	.....	Warner	Stewart	Stewart	Pertman	6	100	U. S.	A-L.	A-L.	Conn.	6	Olympian 45.	
Overland 90.....	5	985/106	31x4	.....	.....	3 1/2x5	Ovn	4	18.23	1-Tillot.	Vacuum	Ovn	Ovn	Own	Ovn	Ovn	Stewart	Stanwell	6	80	U. S. L.	A-L.	A-L.	Conn.	6	Overland 90.	
Engines—Ruten, Rutenberg, Cont., Continental, Weid., Weidely, North, Northway, H-S, Herschel-Splittman, Lyco, Lycoming, D-Lyco, Dort-Lycoming, G. B. & S., Golden, Balknap & Swartz, T-McF., Teeter-McFarlan, S. Monson or Duesenberg, R. & V. Root & Van Dervoort, Carburetor—Strom, Stromberg, Zen, Zenith, Ray, Rayfield, John, Johnson, Mar, Marvel, Sundrum, Siew, Stewart, H-K, Holly-Kingsdon, New, Newcomb, Schuch, Schaeffer, Tillot, Tillison, Johns, Johnston, Generator and Motors—A-L, Auto-Lite, West, Westinghouse, S. Westinghouse, W. Westinghouse, W. L. Ward Leas, L. N. Leas, Westley, A-C, Alfa-Chalmers, Split, Splitdorf, S-N, Simms-Hart, G. & D., Gray & Davis, Ignition—A-K, Atwater-Kent, Conn, Connolly, Eise, Eismann, West, Westinghouse, Vill, Villard, N. E. North East, K-Remy, Dynaco, N. E., North East, L. N. Leas, Westley, A-C, Alfa-Chalmers, Split, Splitdorf, General—G-L, (Grant-Leas) North, Northway, B-L, Brown-Lite, Rear Axle—Col., Columbia, W-Weiss, Walker-Weiss, C-Timk, Cadillac-Timken, West-Mott, Weston-Mott, Universals—Hart, Hartford, Ther-H, Thermoid-Hardy, U. M. Co., Universal Machine Co. Speedometers—J-Man, John-Manville, V-Sticklen, Van Sticklen.																											



Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. E. P.	Carburetor Make and Size	Fuel Feed	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Titms	Battery Amps.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Owen Magnetic O-36	7	4200	35x5	35x5	Optional	3 1/2 x 5 1/2	Buda	6	25 35	Zen.	Vacuum	Own	Own	Spicer	Amer.	Own	Warner	Firestone	24	Willard	Own	Own	Bosch	24	Owen Magnetic O-36
Owen-Magnetic, W-42	7	5500	142	35x5		4 x 5 1/2	Waid.	6	35, 40	Zen.	Vacuum	Own	Own	Spicer	Amer.	Own	Warner	Firestone	24	Willard	Own	Own	Bosch	28	Owen-Magnetic, W-42
Packard 3-25	7	5200	128	35x5	Goodyear	3x5	Own	12	43, 20	Own	Pressure	Own	Own	Spicer	Own	Own	Waltham	Firestone	6	120	Willard	Bijur	Delco	7	Packard 3-25
Packard 3-35	7	5550	136	35x5	Goodyear	3x5	Own	12	43, 20	Own	Pressure	Own	Own	Spicer	Own	Own	Waltham	Firestone	6	120	Willard	Bijur	Delco	7	Packard 3-35
Paige 6-55	7	2050	127	35x4	optional	3 1/2 x 5 1/2	Cont.	6	29, 40	1 1/2 - Ray.	Vacuum	B. and B.	Own	Spicer	Salisbury	Jacob	Stewart	Kelsey	6	108, 4	Willard	Remy	Remy	6	Paige 6-55
Paige 6-39	5	1555	117	35x4	optional	3 1/2 x 5 1/2	Ruten.	6	23, 44	1 - Strom.	Gravity	B. and B.	Own	Own	Salisbury	Jacob	Stewart	Cleveland	6	108, 4	Willard	G. & D.	Remy	6	Paige 6-39
Peterson 6-46	7	1625	120	35x4	optional	3 1/2 x 5 1/2	Cont.	6	25, 35	1 1/2 - Strom.	Vacuum	B. and B.	Durston	Harford	Hess	Jacob	Stewart	Firestone	6	80	Willard	Delco	Delco	6	Peterson 6-46
Peerless Series 4	7	2000	125	35x4	Goodyear	3 1/2 x 5	Own	8	33, 80	Ball	Vacuum	Own	Own	Spicer	Timken	Own	Stewart	Firestone	12	125	Willard	A-L	A-K	6	Peerless Series 4
Phanna R	7	5000	125	32x4	U. S.	3 1/2 x 6	Own	4	24, 70	1 1/2 - H. & N.	Vacuum	Own	Own	Own	Amer.	Own	Warner	Firestone	6		Willard	W-L	Bosch	6	Phanna R
Piedmont	5	1095	114	32x3		3 1/2 x 5 1/2	Own	4	19, 60	Carter								Firestone	6						Piedmont
Piedmont 6-40	5	1450	120	32x4		3 1/2 x 5 1/2	Cont.	6	25, 35	Zen.		B. and B.			Timken			Firestone	6		Willard	Remy	Remy		Piedmont 6-40
Pierce-Arrow 38	7	6006	134	34x4	Goodrich	4 x 5 1/2	Own	6	35, 4	Own	Pressure	Own	Own	Own	Own	Own	Waltham	Goodrich	6-8	135		West.	Delco	6	Pierce-Arrow 38
Pierce-Arrow 48	7	6500	142	35x5	Goodrich	4 1/2 x 5 1/2	Own	6	43, 60	Own	Pressure	Own	Own	Own	Own	Own	Waltham	Goodrich	6-8	135		West.	Delco	6	Pierce-Arrow 48
Pilot 6-5	5	1550	119	32x4	Miller	3 1/2 x 5	Tector	6	23, 44	1 1/2 - Tillot.	Vacuum	B. and B.	Muncie	Hart.	Spoke	Ditweiler	Stewart	Stanwell	6		Prest.	Delco	Delco	6	Pilot 6-5
Premier 6-C	7	2585	126	32x4	Firestone	3 3/4 x 5 1/2	Own	6	27, 34	1 1/2 - Johns.	Vacuum	B. and B.	Detroit	Spicer	Timken	Warner	Warner	Firestone	6	123, 5	Willard	Delco	Delco	6	Premier 6-C
Reo T.	5	1395	120	34x4	U. S.	4 1/2 x 4 1/2	Own	4	27, 23	1 - John.	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	108, 5	Willard	Remy	Remy	6	Reo T.
Revere	7	3850	131	32x4	optional	4 1/2 x 6	8	4	30, 63	1 1/2 - Strom.	Vacuum	B-L	B-L		Tim.-Ball		Stewart	Houk	6	120	Willard	West.	Bosch	6	Revere
Roamer 6-54	7	128	32x4		Goodyear	3 1/2 x 5 1/2	Cont.	6	29, 40	1 1/2 - Strom.	Vacuum	B. and B.	G-L	Arvac	Hess	Jacob	Warner	Hayes	6	115	Col.	Bijur	Bosch	6	Roamer 6-54
Saxon Y-18	5	1195	112	32x3	Goodyear	2 7/8 x 4 1/2	Cont.	6	19, 84	1 - Strom.	Vacuum	Own	Own	Spicer	Timken	Warner	Stewart	Firestone	6	60	Prest.	Wagner	Remy	6	Saxon Y-18
Sayers Six	5	169																							

STEAM CARS																						
Stanley 735.....	7	3450	130	35x4	optional	4x5	Own	2	.....	none	none	none	none	none	none	Willard	6	Firestone	Warner	Warner	6	Stanky 735.

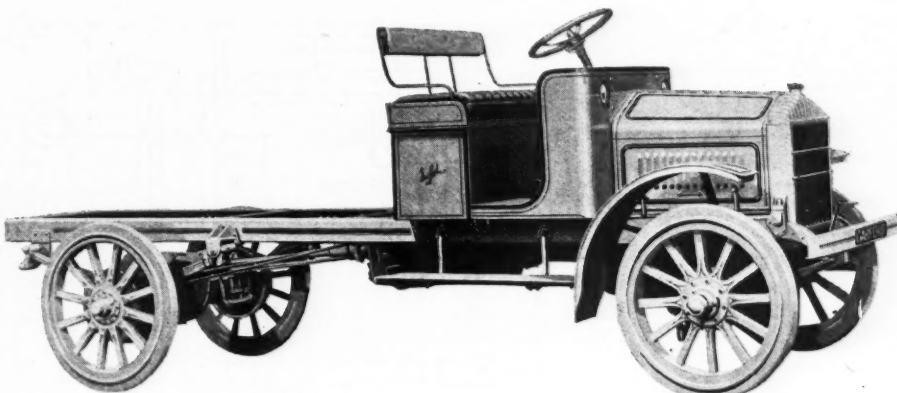
**Engines**—Rutenber; Cont., Continental; Weid., Weidely; North, Northway; H-S, Herschell-Spillman; Lyco., Lyeomeng; D-Lyco., Dort-Lyeomeng; G. B. & S, Golden, Belknap & Swartz; T-McF., Teetor-McFarlan; \*, Monson or Duessenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom, Stornberg; Zen., Zenith; Ray, Rayfield; John, Johnson; Mar., Marvel; Sund., Sunderman; Stew., Stewart; H-K., Holley-Kington; Newe., Newcomb; Schebl., Schebel; Tillot., Tillotson; Johns, Johnston. **Generator and Motor**—A-L, Auto-Lite; West., Westinghouse; \* West., Westinghouse or Auto-Lite; W-L, Ward Leonard; Dyn., Dyntco; N. E., North East; L-N, Leece-Neville; A-C, Allis-Chalmers; Split., Spliford; S-N, Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K, Atwater-Kent; Conn., Connecticut; Eise., Eisenmann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Bering; Bosch-W., Bosch-Westinghouse; Split., Spliford. **Gearset**—G-L, Gruffs-Gale; North, Northway; B-L, Brown-Lipe. **Rear Axle**—Col., Colchester; Eise., Eisenmann; West., Westinghouse; Will., Willard; N. E., North East; Thermoid-Hardy, Thermo-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man, Johns-Manville; V-Sicklen, Van Sicklen.

## Garford Adds 1¼-Ton Truck to Line

Electric Equipment and Pneumatics Optional

**A**LTHOUGH model 25, the latest addition in the Garford truck line, is listed as a 1¼-tonner, in its construction are embodied characteristics of strength obtainable in a truck of 1½-ton capacity. For instance, it has a rear axle and frame tested to 1¼-ton, with a gear set of the same type. Provision has been made for the installation of electric lighting and starting, and pneumatic cord tires, 36 by 6 all around. A power tire pump and extra rim also are furnished as extras. The chassis will sell at \$1,890 with \$125 extra for electric equipment and \$285 extra for pneumatics.

The engine, a four-cylinder with a bore and stroke 3¾ by 5½ inch, is of sturdy design, employing a heavy crankshaft of the three-bearing type and cast-iron upper and lower crankcases. The cylinders are cast in block with heads and valve chambers integral. The valves are large and ample water jacketing is provided. The engine has an S. A. E. rating of 22 hp. and is



Garford 1¼-ton truck which sells at \$1,890

fitted with high-tension magneto and a 1-inch Stromberg carbureter.

Quietness of operation is characteristic of this model. When electrical equipment is required the magneto is driven in tandem with the generator, thereby eliminating the necessity of chains for this unit. The timing train

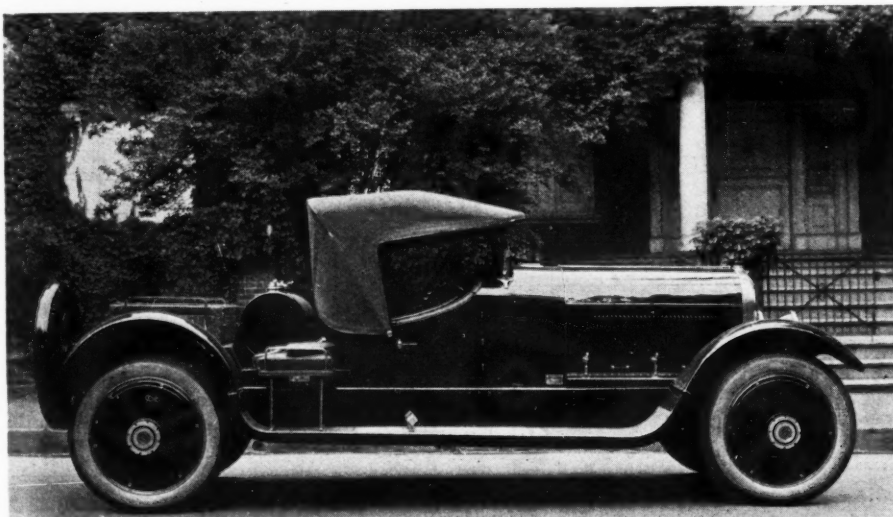
is limited to three gears, and the timing gears, which operate in oil, are helical in form and of very broad face. The crankshaft and four long rod bearings are of the bronze-shell, babbitt-lined type. The upper rod bearings are hard bronze. The pistons and connecting rods are of unusual length and the piston sweep is confined practically to the cylinder bore, only a very small portion protruding below the cylinder base when at dead center.

The clutch is of the multiple dry-disk, ball-bearing type inclosed in a housing attached to the flywheel case, which in turn is integral with the crankcase. The shafts are mounted on roller bearings throughout. The front driveshaft is tubular with fabric disk universals, requiring no lubrication and eliminating possibilities of grinding and rattle. The rear universal is a Spicer. The front axle is of Garford design, using Timken bearings.

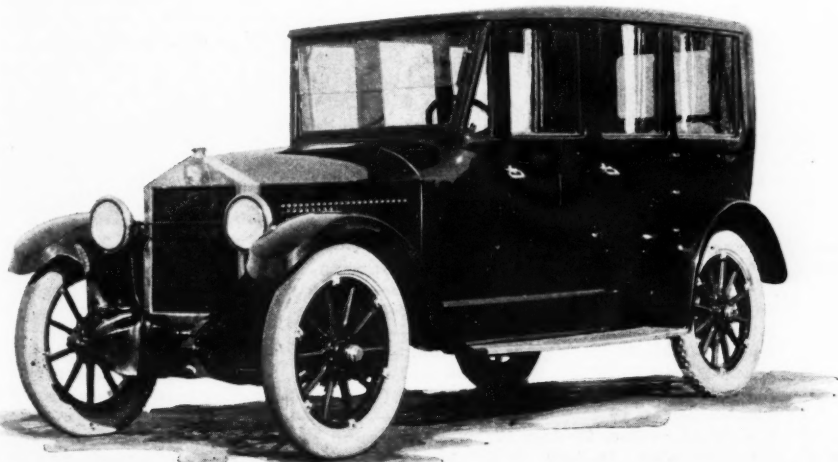
Brake control is conventional. There are two independent sets of brakes, operating on the rear wheels. Both braking systems have equalizers. Brake shoes, levers, drums and operating parts are unusually heavy, corresponding in size to most 2-ton equipment, it is claimed. The radiator also is of heavy truck pattern and is mounted on a cushion suspension.

Front and rear springs are semi-elliptic, the former being 42 by 2½ in. with eight leaves and the latter 50 by 2½ in. with eight leaves. The spring shackles are of drop-forged, heat-treated steel. Lubrication of the shackle pins is by oil feed.

The frame is of 7-32-in stock with a depth of 5 in and a width of 2½ in. It is of pressed steel construction and has six pressed steel, channel-section cross-members. Front and rear wheels are wood with S. A. E. felloe bands. Standard tire equipment is solid pressed-on type, 36 by 3½ in. front and 36 by 4 in rear. A special effort has been made to standardize the model with the result that odd wrenches and spanners are not required.



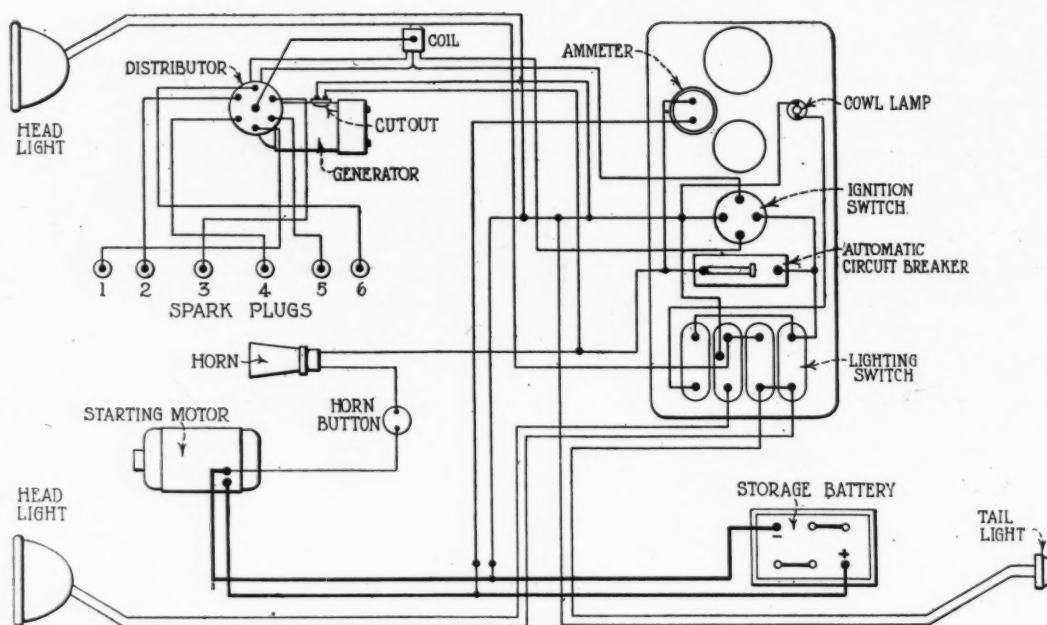
Body designed and built by Charles Schutte Body Co. on a Marmon chassis



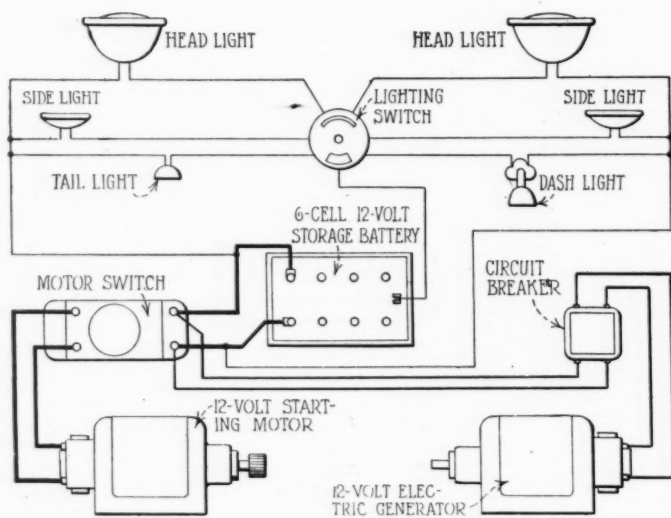
Here is a view of the Moon 6-66 sedan



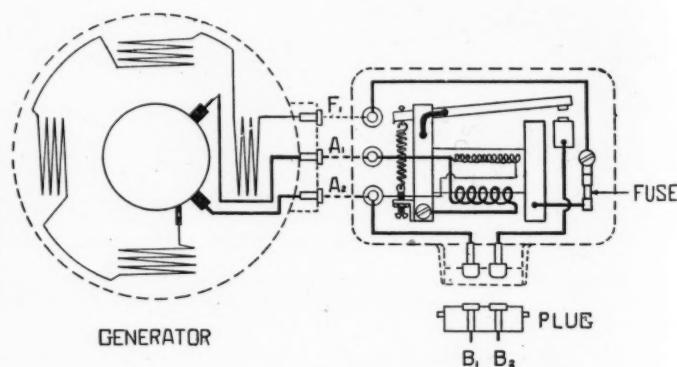
# Motor Age Wiring Chart No. 44



*Leece-Neville system used on 1917 Haynes light six*



*Leece-Neville system used on 1913 and 1914 cars*



*Generator and cutout in Leece-Neville system of 1917, showing connections of third brush*

Special Systems for Fords—May 15-22  
General Battery Charging—May 29  
General Magneto Diagrams—June 5  
Internal Connections—July 10-17-24

Abbott—March 20-27  
Aleo—April 24  
Alter—Nov. 4  
Apperson—March 6  
Buick—Nov. 21-April 3  
Cadillac—Dec. 9  
Cartecar—May 1  
Cole—Jan. 23-April 3  
Case—Feb. 27  
Chalmers—Feb. 20  
Chandler—April 3

Chevrolet—Nov. 28-Mar. 27  
Crow-Elkhart—June 26  
Davis—May 8  
Detroit—March 6  
Dodge—Dec. 12  
Dort—March 13  
Elgin—Feb. 27  
Empire—March 13  
Ford—Jan. 30  
Franklin—June 19  
Grant—Feb. 27-Mar. 27

Henderson—April 3  
Hudson—Dec. 5-May 1  
Hupmobile—Feb. 13  
Interstate—March 13  
King—July 3  
Kissel—July 3  
Krit—Feb. 6  
Lexington—April 24  
Little—March 20  
Locomobile—Jan. 23-Apr. 17  
Maxwell—Jan. 16-Aug. 14

Marion—March 6-20  
Mercer—Jan. 23-Aug. 28  
Michigan—March 20  
Mitchell—Jan. 9  
Murray—May 1  
National—June 19  
Oakland—Jan. 2  
Oldsmobile—Jan. 23  
Overland—Nov. 7-14  
Packard—June 19-July 3  
Paige—July 3  
Paterson—June 26

Premier—April 10  
Pullman—April 10  
Regal—Feb. 6-April 10  
Reo—Feb. 27-Aug. 21  
Saxon—April 17  
Scripps-Booth—Dec. 26  
Simplex—April 17  
Stanley—June 26  
Stearns-Knight—April 24  
Studebaker—April 26  
Velle—April 24  
Westcott—May 8

# Valve Timing

## Motor Age Maintenance Data Sheet No. 52

One of a series of weekly pages of information valuable to service man and dealer—Save this page  
Measured in Degrees and Minutes

### 1917 Cars

	Intake		Exhaust		Valve Clearance		Valve Stems	
	Opens After Upper Dead Center	Closes After Lower Dead Center	Opens Before Bottom Dead Center	After Top Dead Center Closes	Intake	Exhaust	Valve Diameter	Diameter Length
Apperson 6-17	15	45	55	10	.343	.343	1.6875	.3745 6 1/8
Apperson 8-17	15	45	55	10	.343	.343	1.5625	.374 5 3/8
Auburn 6-44	10	28	40	2-30	.003	.005	1.734375	.328 5 1/8
Auburn 639	0	33	67	0	.003	.005	1.5625	.310 4 3/8
Bour-Davis 17	0	33	67	0	.....	.....	.....	.....
Bour-Davis 17-B	10	28	40	2-30	.....	.....	.....	.....
Briscoe 4-24	7	33	45	3	.004	.004	.8125 .625	.3720 5 3/8
Cadillac 55	0	46-40	46-40	0	.0025	.0025	1.6875	.375 7 1/8
Case T	10-24	33-46	45	9	.004	.004	1.625	.375 6 3/8
Chalmers 35A & 35B	0	50	50	10	.003	.003	1.5625	.3125 6 1/4
Chevrolet 490	16	52	40	16	.002	.002	1.5	.310 4 5/8
Chevrolet F	20-18	53-42	43-42	12-18	.002	.002	1.5	.310 4 5/8
Chevrolet D	0	56	46	10	.002	.002	1.5	.310 4 5/8
Cole 860	15	38	45	10	.3437	.3437	1.5	.373 4 5/8
Columbia C & D	0	33	67	0	.004	.004	1.5625	.3125 4 5/8
Crawford	10	28	40	2-30	.003	.005	1.5625	.310 4 3/8
Crow-Elkhart CE-35	5	37	47	10	.003	.004	1.375	.375 5 1/8
Davis 16-H	0	33	67	0	.003	.005	1.5625	.310 4 3/8
Davis 6-J	10	28	40	2-30	.003	.005	1.734375	.328 5 1/8
Dixie Flyer LS-35	8	45	45	8	.004	.004	1.75	.4375 6 3/8
Dodge	10	35	45	8	.004	.004	1.6875	.372 6 3/8
Dorris I-C-6	10	45	45	10	.....	.....	.....	.....
Dorris I-B-W	10	45	45	10	.....	.....	.....	.....
Dort 9	15	37-42	47-18	5	3	3	1.59375	.375 5 3/8
Ford T	12-40	50-49	37-52	0	.025	.025	1.42175	.311 4.975
Franklin 9A	18	49	51-30	17	.010	.010	1.5	.277 4 5/8
Geronimo 4-4-40	5	37-42	47-18	10	.003	.003	1.375	.374 5 3/8
Glide 6-40	15	50	45	10	.002	.003	1.3125	.3125 5 5/8
Haynes 36-37	5	35	47	2	.....	.....	1.5625	.4375 6 5/8
Haynes 43-44	5	35	47	2	.....	.....	1.375	.3125 4 5/8
Hudson H	7	42	55	8	.004	6	1.8125	.375 6 5/8
Hupmobile N	0	24	39	5	.003	.003	1.75	.375 7 1/8
Jordan B	10	28	40	2-30	.004	.004	1.6875	.372 5 43/64
Kissel Kar 6-42	15	50	45	10	.004	.004	1.9375	.4375 7 1/8
Kissel Kar 100 Pt. Six	10	33	45	5	.004	.004	1.8725	.375 5 5/8
Klinekar 6-38-F	12	45	55	12	.004	.004	1.5625	.3125 5
Lexington 6-0-17	12	45	55	12	.004	.004	1.325	.310 5 1/8
Liberty 10-B	11	35	10	35	.004	.004	1.5625	.375 5 3/8
(Locomobile 38	0	*3/8	*3/4	*1/8	.....	.....	2.5	.433 7 5/8
(Locomobile 48	0	*3/4	*1	*1/8	.....	.....	2.125	.433 8 1/8
Marmon 34	19	35	45	12	.003	.003	1.9375	.375 5 3/8
Maxwell	5	40	35	5	.....	.....	.....	.....
McFarlan	10	40	55	5	*	*	.....	.....
Mercer	5	55	70	15	.003	.004	2.125	.370 9
Mitchell C-42 & D-40	15	71	59	19	.003	.003	1.5625	.372 6 1/8
Moline-Knight C	18	50	5	50	.....	.....	.....	.....
Moline-Knight G	20	50	5	20	.....	.....	.....	.....
Monitor M & O	0	33	67	0	.003	.005	1.5625	.310 4 3/8
National AE	10	28	40	2-30	.003	.003	1.59375	.372 6 1/8
National AH	5	49	55	5	.004	.004	1.675	.341 4 3/8
Nelson	15	35	45	10	.005	.005	1.25	.3125 5 1/4
Oakland 34	17 1/2	38	42.5	50	.3446	.3446	1.125	.3125 5
Oldsmobile 45	15	38	45	10	.004	.004	1.125	.310 4 3/8
Oldsmobile 37	17 1/2	38	42	7-30	.008 .010	.008 .010	1.125	.310 4 1/8
Overland 83 & 85-4	8	38	46	15	.012	.012	1.675	1.8125 5 3/8
Overland 85-6	0	33	67	0	.002	.002	1.390625	1.5625 5 1/8
Overland 86-B	10	28	40	2-30	.002	.002	1.556925	1.6875 6 3/8
Overland 75-B	8	38	46	15	.003	.003	1 1/8	1.75 8 1/4
Owen-Magnetic 0-36	5-30	34	60	3-30	.005	.005	1.6875	.372 7 1/2
Owen-Magnetic M-25	10	28	40	2-30	.005	.005	1.546	.372 6 1/8
Packard	9	42-30	47-30	4	.0025	.004	1.65625	.359 641/64
Paige 6-39	15	50	45	10	.003	.003	1.4375	.3110 5 3/8
Paige 6-51	10	28	40	2-30	.003	.003	1.6875	.3720 6 1/8
Peerless 56†	15-30	63 1/2	63-30	15-30	.....	.....	1.75	.371 6 3/8
Peerless 56†	16	54	54	6	.....	.....	1.75	.371 6 3/8
Phianna M	0	45	55	20	.004	.004	1.8125	.372 8

\*Inches piston travels.

†Before. ‡After.



# Service Equipment

## Time Savers of the Shop

### Badger All-Steel Creeper

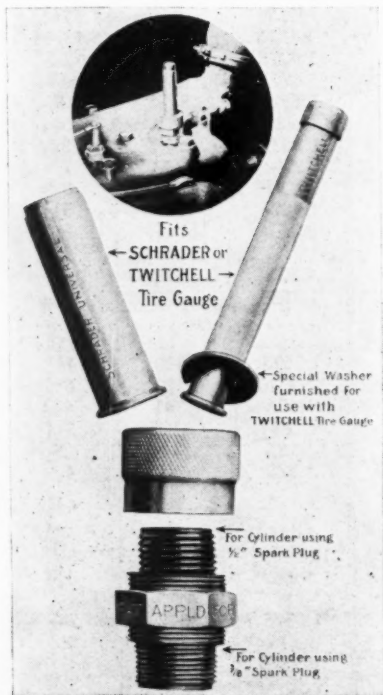
THE creeper shown is made entirely from steel, except the head-rest, which is soft and is upholstered. The side of the creeper is fitted with tool trays on either side. The casters are large and securely fitted to the angle iron frame of the creeper. This creeper is manufactured by the Badger Mfg. Corp., Milwaukee, Wis.

### Duplex Compression Tester

The Duplex compression tester enables a mechanic to apply either a Twitchell or Schrader tire gage to the coupling and screw it into the spark plug opening. The engine then is turned over by hand and the compression pressure is registered on the tire gage. By adapting a tire gage to this use it is possible to determine many times the cause of trouble that ordinarily would be detected only by tearing down the engine. The Duplex tester lists at \$1. It is manufactured by the Casey Hudson Co., 357 Ohio street, Chicago.

### Hydrate Cell Tester

The Hydrate tester is an instrument which quickly determines the condition of the plates in a cell. The instrument is a sensitive voltmeter which gives a reading of the voltage in each cell while the cell is under a heavy discharge.



Duplex compression tester for use with Twitchell or Schrader gage

An ordinary voltmeter reading under no discharge does not indicate anything, for a discharged cell registers almost as much as a fully charged cell. But when each cell is measured under discharge the difference in voltage becomes more pronounced. This is the



Hydrate tester for storage battery cells



Badger all-steel creeper for garages

effect taken advantage of in this testing instrument. The instrument is rigidly constructed, designed to withstand heavy usage, and made by the Service Station Supply Co., 30 East Larned street, Detroit.

### Ideco Filing Station

Increased gasoline sales due to modern dispensing apparatus can be had by any service station if the proper apparatus is installed. The Ideco full measure gasoline filling station, manufactured by the Ideco Mfg. Co., Inc., Springfield, Ill., helps the gasoline business because the customer is able to see just how much gasoline he is getting. In this station there are two 5-gal. bottles placed over the control

valves and in plain view of the motorist. Each bottle is graduated to read in gallon measures. If the customer asks for 5 gal. of gasoline, one bottle is emptied. If the request is for 10 gal. both bottles are emptied, either one at a time or two at the same time. If only 3 gal. are asked for, the gas is drawn from one bottle until the level reaches the 3 gal. mark. At the top of this filling station is a large glass dome which can be illuminated at night. The light also is thrown upon the visible supply bottles. Another feature of this equipment is the unit valve. With this valve the bottle can be drained to the storage tank or the bottle can be filled from the tank, the supply in the bottle can be retained or the gasoline can be drained to the tank of the motor car.

### Se-Ment-Ol Silent Salesman

A new silent salesman is being distributed to the dealers of Se-Ment-Ol, the radiator mender. The display stand is made of metal and will not soil or become damaged from use. Se-Ment-Ol is a preparation for repairing leaking radiators. It is sold in either powder or liquid form. It is manufactured by the Northwestern Chemical Co., Marietta, Ohio.



Ideco full measure gasoline filling station

# The Accessory Corner

## New Fitments for the Car

### Two-Fuel Adapter

THE two-fuel adapter is a steering post control for admitting either gasoline or kerosene or a mixture of both in any proportion to the carburetor. A wire control from the dash adjustment to the three-way valve under the hood operates the control lever. With this device a separate tank must be installed. The separate tank can be installed under the hood and filled with gasoline while the regular tank can be filled with kerosene. The engine can be started with the control set at the gas position shown and as it warms up the lever can gradually be moved. The device is made by the Breeze Mfg. Co., Newark, N. J.

### Airplane Radiator Fan

The Juelson fan for Fords is an application of airplane propeller principles to the cooling fan of a motor car. The fan has two blades, the blades being shaped very much like the blades of an airplane propeller. The manufacturers of the fan claim that the peculiar shape of the blades produce a large volume of air moving at a high velocity and that the air is confined to a slender column and therefore is not so readily thrown out the louvers of the hood. The fan is fitted with a standard pulley and bearings so that it is replaced on the Ford fan spindle. It is made by Walker & Wells, Amesbury, Mass., and is distributed by the Amer-

ican Aero Co., 2637 Michigan avenue, Chicago.

### United Spark Plugs

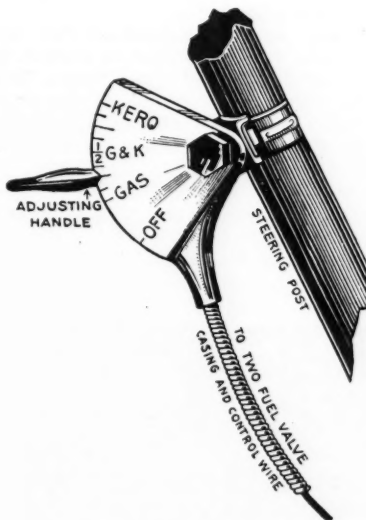
A special feature of the spark plugs manufactured by the United Mfg. & Distributing Co., Lake Shore drive and Ohio street, Chicago, is the locked terminal feature. This terminal retaining feature embodies a spiral spring which is incased above the porcelain. It keeps the ribbed top of the plug tight up against the ribs of the terminal clip. These ribs fit into grooves in the thumb screw and lock and so form a positive contact. The plug itself is of very heavy construction and is made in two sizes, the heavy-duty size for trucks and tractors and the junior model for cars.

### Greer Tractor Clevis

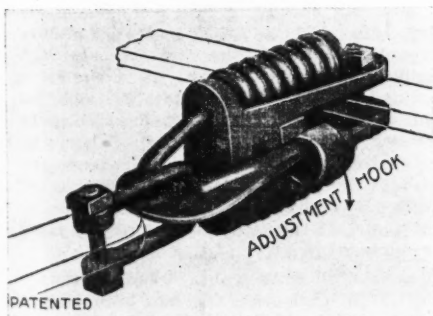
The Greer tractor clevis is an automatic coupling that immediately uncouples the plow from the tractor if the plow encounters a rock or some obstruction. The clevis can be adjusted for two-, three- and four-bottom plows. The operation of the clevis can be understood by examining the illustration. When a pull is encountered which stretches the retaining hook beyond the sliding adjustment the retaining hook is released from the slide and immediately straightens out. This allows the connection to the tractor to disengage. The clevis is manufactured by the Erwin Greer Automobile Co., Chicago, and sells for \$8.50.



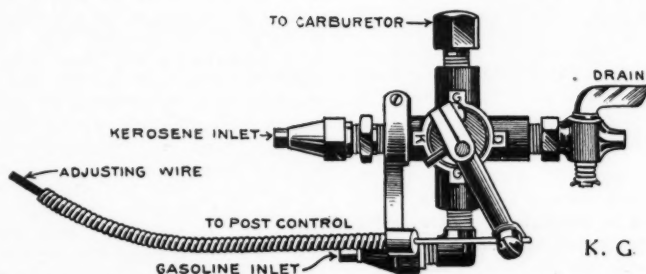
United spark plug



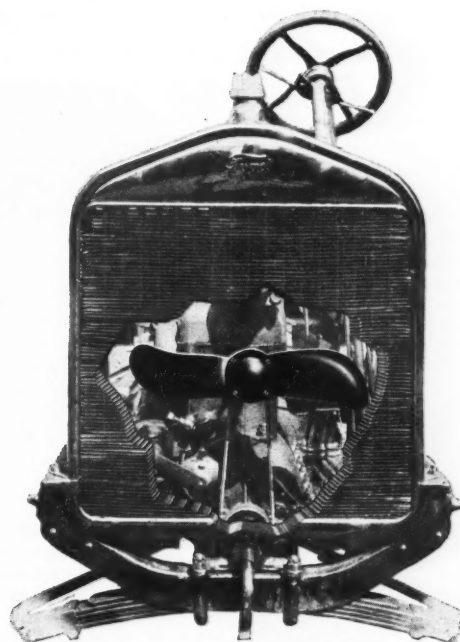
Steering post control for admitting gasoline or kerosene or a mixture to the carburetor



Greer tractor clevis



Carburetor attachment of the two-fuel adapter. The adjusting wire leads to the steering post



Juelson airplane radiator fan



# Among the Makers and Dealers

## Short Trade Notes

**Traffic Truck Adds to Plant**—The Traffic Motor Truck Corp., St. Louis, Mo., is building an addition to its plant. The new building will cover the block adjacent to the present traffic plant and will be of modern brick construction, 150 by 200 ft.

**Federal Truck for Southern Wisconsin**—The Osmond-Kemler Co. Madison, Wis., distributor of the Maxwell and Chalmers, has taken on the Federal truck for the southwestern Wisconsin territory. The appointment of the Lester Bros. Motor Co., Madison, as dealer in Madison and vicinity, is announced. This firm is composed of Stark Lester and Louis Lester.

**Brenckle Goes to Olympian Factory**—Arthur C. Brenckle, president of the Olympian Car Co., Milwaukee, Wis., who was elected a director of the Olympian Motors Co., Pontiac, Mich., a year ago, has been called to the factory to take an executive post in the organization. He retains his interest in the Milwaukee business, which consists of the distribution of the Olympian and the Denby truck in Wisconsin. Frank C. Linter, vice-president, succeeds Mr. Brenckle as active manager.

**Late Tire Elects Officers**—The Late Tire & Rubber Co., organized recently at Fond du Lac, Wis., with \$100,000 capital and now constructing a complete tire and rubber factory, has perfected its organization by the election of the following officers: President, F. S. Dannenberg; vice-president, J. T. Brofka; secretary, J. T. Jones; treasurer, O. J. Kohl. The new plant will cost about \$70,000 and is expected to be ready about Nov. 1.

**Aluminum Specialty Adds Branch**—The Aluminum Specialty Co., Manitowoc, Wis., has concluded arrangements for the establishment of a branch factory at Chilton, Wis., where an investment of \$75,000 will

be made in buildings and equipment. Work is under way on the first unit, three stories, 65 by 115 ft., with a separate power house. The initial force will number 100. Walter Spindler is president and general manager.

**St. Louis Oaklands in Driveway**—A driveway of eleven Oakland cars was made from the factory at Pontiac, Mich., to St. Louis, Mo., by H. G. Sperreng and a corps of drivers.

**Giddings & Lewis New Department**—The Giddings & Lewis Mfg. Co., Fond du Lac, Wis., manufacturer of machine tools and special machinery, is establishing a new department for producing tractor transmission units designed by its engineers.

**Zone Supervisor for Maxwell**—Zone headquarters for the Maxwell Motor Sales Corp. and the Chalmers Motor Car Co. have been established in St. Louis, Mo., with I. O. Taft, supervisor, in charge. His territory consists of Illinois, Missouri, Kentucky, Arkansas, Tennessee, Alabama, Mississippi, Louisiana and Texas.

**To Make J E F Spark Plug**—The Ramstack & Sons Mfg. Co., Milwaukee, Wis., is being organized with a capital stock of \$100,000 to manufacture the J E F spark plug. The present plant of the J E F Spark Plug Co. will be used by the new concern. The J E F company is completing a new machine shop.

**Bull Dog Tractor Organizes**—The Bull Dog Tractor Co. has been organized at Oshkosh, Wis., by J. H. Tritz, Eber Simpson and Arthur H. Gruenwald, who have developed a new tractor design employing an all-wheel drive transmission system. The capital stock is \$750,000. A plant will be opened at once.

**Philadelphia Offices for Willys Light**—The Willys Light Division of the Electric Auto-Lite Corp. has established offices in

Philadelphia, Pa., and appointed George R. Bollinger manager of the Philadelphia district. District sales offices now have been established in this city, Detroit, St. Louis, Denver, Spokane, Syracuse, Atlanta, Minneapolis and Dallas.

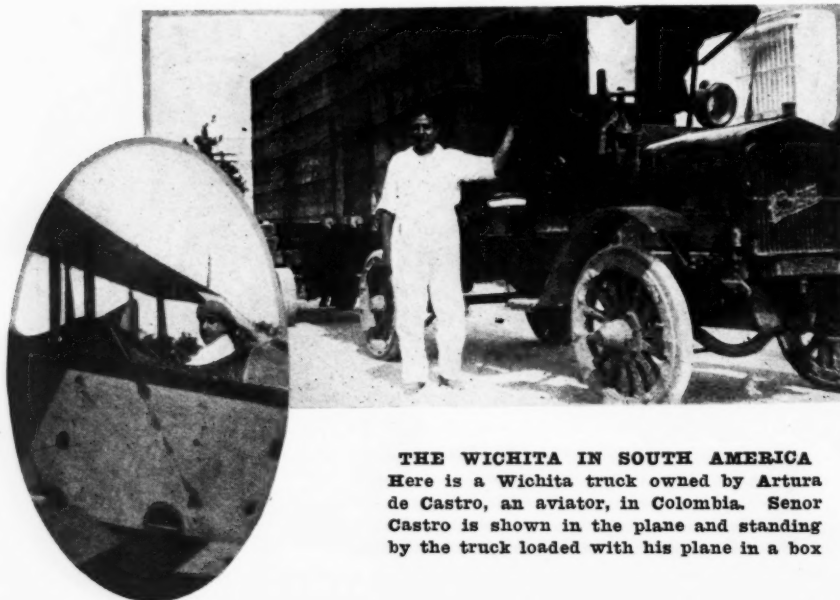
**Clark to Manage Eisemann Advertising**—E. Stanley Clark, who has been with the Eisemann Magneto Corp. for the past two years, has been made advertising manager of the concern, with headquarters at the Eisemann plant, Brooklyn, N. Y.

**New Tire Plant for Cleveland**—A tire factory, to be known as the Zenith Tire & Rubber Co. and capitalized at \$10,000,000, is to be erected in Cleveland, Ohio. A tract of 200 acres has been purchased and plans drawn for the various factory buildings. Cleveland and Akron men are interested.

**Pendleton to Distribute Bessemer**—John M. Pendleton has been appointed distributor for the Bessemer truck for New York state as far north as Schenectady; and for all of Massachusetts and Rhode Island. He has opened a complete sales, service and parts station in New York under the name of the Bessemer Agency of New York. Mr. Pendleton was formerly sales manager of the New York branch of the Sterling Motor Truck Co., Milwaukee, Wis.

**New Building for Northwest Fordson**—Vick Brothers, Salem, Ore., state distributors for the Fordson tractor, have let the contract for immediate erection on a 100 by 100 ft. site in Portland of a two-story and basement brick and concrete building to be used exclusively for Fordson sales and service. It will cost approximately \$60,000, and work will be rushed so they can occupy it this fall. Incidentally, this will be the largest building devoted exclusively to tractors in the Pacific Northwest. With its completion Portland will become the state distributing point for Fordsons. Vick Brothers recently disposed of the Ford agency in Salem and the Valley Motors Co., same town, to devote their attention exclusively to tractors. They have been so successful that their allotment of 1000 Fordsons is to be increased.

**Continental Axle Takes Over Higgins**—The Continental Axle Co. has been organized as a Wisconsin corporation with a capital stock of \$200,000 and headquarters at Edgerton, Wis., to take over the business and equipment of the Higgins Spring & Axle Co. of Racine, Wis. Ground has been broken for the first unit of a new plant in Edgerton, to be 200 by 300 ft. Pending the completion of the building, the present Higgins works in Racine will be continued in operation. The present line of front and rear axles and springs for vehicles will be enlarged to embrace tractor and trailer units. James W. Menhall, who is president and general manager of the Highway Trailer Co., Edgerton, is the prime mover in the new Continental organization, which, however, will be conducted as a distinct and separate enter-



**THE WICHITA IN SOUTH AMERICA**  
Here is a Wichita truck owned by Artura de Castro, an aviator, in Colombia. Senor Castro is shown in the plane and standing by the truck loaded with his plane in a box

prise. The two factories are located on adjoining sites. Other members of the new company are stockholders in the Highway and Higgins companies.

**McSweeney with Detroit Transmission**—Louis J. McSweeney, identified in the parts manufacturing business for years, recently was elected vice-president of the newly formed Detroit Transmission Co. He has severed his connections with all other enterprises to devote his entire time to the new organization.

**Ross Contract for \$500,000 Worth**—A. G. Ross, president of the Franklin-Ross Motor Car Co., Franklin distributor in St. Louis, Mo., has returned from a visit to the factory, where he spent exactly 55 min. signing a contract for \$500,000 worth of cars. He also delivered a car to a buyer who accompanied him and started a two-carload shipment to St. Louis. He traveled by rail to Syracuse 168 miles by motor car to Buffalo and thence to St. Louis by rail.

**General Motors to Build for Employees**—General Motors is planning to erect a dormitory building in Flint, Mich., for employees. The cost is estimated at between \$2,300,000 and \$2,500,000. It will be a seven-story building, occupying a full block, the building proper to be 280 by 214 ft. It will contain sleeping quarters for 1168 men, eating accommodations for 1300 men, recreational facilities for 350 at one time, amusement for 700, an auditorium with a capacity of 1279 and educational facilities for 430 at one time, making it possible to keep 2759 persons agreeably occupied in the building at once. It is expected the building will be completed within nine months.

**Ajax Rubber Plans Expansion**—To provide additional working capital and for the construction of a new factory, the directors of the Ajax Rubber Co. voted to increase its capital by issuing 36,000 shares of capital stock, completing the total authorized capital of 200,000 shares, and to offer this stock to stockholders at \$70 per share. A quarterly dividend of \$1.50, payable Sept. 15 to stockholders of record Aug. 30 also was declared.

**To Make Truck and Car Wheels**—The Northern Wheel Co., to be incorporated under the laws of Delaware with a capital stock of \$1,000,000, is being organized at Alma, Mich., by A. B. Smith of St. Johns, formerly of the Hayes Wheel Co. Ground has been purchased for a factory site. The company will make wooden wheels for both commercial and passenger cars and later will install a pressed steel foundry and make steel wheels. The factory proper will be 304 by 60 ft., one story high, with a separate heating plant. Work on the building is to be completed by Dec. 1. The company plans to start operations with 125 men.

**Old Supply Concern Changes Hands**—The Kansas City Automobile Supply Co., the oldest wholesale and retail establishment of the kind in Kansas City, Mo., is in new hands. The business was established by J. H. Wittman in 1900, Otto Wittman joining his brother three years later. J. H. Wittmann began the manufacture of specialties, and sold his interest to Otto. The purchasers of the business are Thomas E. Hafer, for ten years in accessory selling, and George H. Lockridge, an attorney. The company has already employed salesmen and supplied

them with cars for covering Missouri, Kansas and Oklahoma. The company will continue to distribute the camping equipment made by the J. H. Wittman Mfg. Co.

**Carlisle Western Branch**—The Carlisle Tire & Rubber Co., Carlisle, Pa., has opened a branch in Los Angeles, Cal. R. C. Cooper formerly connected with the Para Auto Tire Co., Chicago, is in charge.

**Larger Quarters for Albion Hayes**—The wheel plant, Albion, Mich., has purchased the former plant of the Albion Chemical works. Expansion at the Hayes plant has necessitated these larger quarters.

**Eastern Distributors for Cleveland**—Herbert Brothers, Philadelphia, have been made distributors for the Cleveland six in the territory extending from eastern Pennsylvania, New Jersey, Delaware and Maryland to Washington.

**New Building for Apco**—Work has been started on a new machine shop and assembling building for the Apco Mfg. Co., Providence, R. I., which will more than double present floor space and will be ready for occupancy early in October.

**Fernald Goes to Pacific Coast**—A. E. Fernald, for several years manager of the commercial car division of Willys-Overland, has gone to the Pacific coast to take charge of Willys-Overland coast publicity. His office headquarters will be in San Francisco, but he will spend much of his time in the Pacific Northwest.

**Daubner Resigns from Barley**—George H. Daubner, chief engineer for the Barley Motor Car Co., Kalamazoo, Mich., for the last six years has resigned. His future plans have not been announced. L. F. Goodspeed, member of the engineering staff, is acting as chief engineer at present.

**To Sell Garford in Kansas**—T. J. Ragland, with the Garford Motor Truck Co. of Missouri, and George D. Searce have formed a partnership for distribution of Garford trucks, having acquired the business from R. T. Conger, president of the former Garford company. Their territory is western Missouri and Kansas.

**Gilbert Leaves Timken-Detroit**—Frederick C. Gilbert, vice-president and director of the Timken-Detroit Axle Co. in charge of sales and publicity, who has been with the organization since its formation ten years ago, has resigned. Prior to this connection he was for fourteen years with the Pope Mfg. Co., as general production manager for several of its plants, including the Pope Motor Car Co., Toledo, Ohio, later sold to Willys-Overland interests. Mr. Gilbert plans to take a rest before making any announcement of future plans.

**Harris Becomes Bethlehem G. M.**—H. F. Harris has been appointed general manager of the Bethlehem Motors Corp., Allentown, Pa. Mr. Harris is an industrial engineer who has had experience with the Everett, Studebaker, Maxwell and Overland organizations, and for the last two years has been with the Republic Motor Truck Co.

**Booth Heads Hartford Firestone**—C. R. Booth of Pittsburgh has been appointed manager of the Hartford branch of the Firestone Tire & Rubber Co., succeeding Robert M. Ruble who goes to Springfield, Mass.

**Columbus Oldsmobile Is Building**—The Columbus Oldsmobile Co. has started a new salesroom and service station which will

be finished soon. The structure will be 63 by 187½ ft., two stories and basement, and will cost in the neighborhood of \$115,000.

**Westinghouse Indianapolis Office**—The Westinghouse Electric & Mfg. Co. has reopened its Indianapolis office for the automotive equipment department, which was closed during the war. Knox Easterling is in charge.

**Building for St. Louis Distributor**—A four-story fireproof building will be erected for the St. Louis Motor Car Co., Jordan, Mitchell and Saxon distributor. The new building will be ready for occupancy about Jan. 1.

**Myton Comes Out for Office**—J. Clyde Myton, the genial and well-known secretary of the Harrisburg Motor Car Dealers' Association, has announced his candidacy for sheriff of Harrisburg on the Democratic ticket. Myton has been identified with the trade there for many years and has worked hard for betterments in conditions, co-operation and good laws.

**Bates Distributor Shows Growth**—The Bates Steel Mule Co. of Ohio after eighteen months of work in the state has established three principal offices. The main office is at Lorain, and A. K. Hibbard, who organized the Ohio business in Cleveland, is in charge. J. P. Jones is manager of the Cleveland office, and Harvey W. Smith is in charge at Columbus.

**New Garage Planned by Dayton Company**—Work will start soon on a two-story fireproof garage for the Consolidated Automobile Co., Dayton, Ohio. The establishment, which will be finished some time in November, will contain 30,000 sq. ft. of floor space. It will be used as a garage and salesroom.

**Liberty Buildings Near Completion**—The first unit of the group of new factory buildings being erected by the Liberty Motor Car Co. is nearing completion and is practically ready for occupation. The new building will house the closed body mountings, experimental and service departments as well as a restaurant for employees. Arrangements already are being considered for enlarging this building in the spring.

**Building Permits for Detroit Concerns**—Among the recent building permits issued at Detroit are several for automotive factory buildings. The Parker Rust-Proof Co. obtained a permit for a \$75,000 office and factory and the Cadillac Motor Car Co. a permit for a \$15,000 machine shop.

**Traffic Truck in Movies**—Harry H. Hawks, general sales manager, and G. Elmo Holke, publicity manager, of the Traffic Truck, St. Louis, have turned to writing scenarios. Under their direction a film is being made to show the advantages of the truck to the farmer, point out graphically how the truck has brought the farmer closer to the city market. Outside scenes were taken on farms, and the film includes scenes of the making of traffic.

**Bishop Truck at New Location**—The Bishop Truck & Tractor Co., St. Louis, Mo., distributor of the Stewart, Sandow and Briscoe trucks, will occupy the western portion of the building to be vacated by the McQuay-Norris Co., whose new factory will be ready about Oct. 1. The eastern portion of the building has been leased to the Fred Campbell Auto Supply Co.



# From the Four Winds

## Glimpses at the World of Motordom

**Detroit May Use Unclaimed Cars**—City departments in Detroit requiring motor cars in the future may have their needs supplied from the assortment of stolen cars recovered by the police but never claimed by their owners. This suggestion has been to the city commission and probably will be acted upon favorably. The police department has been selling these unclaimed cars at public auction every year.

**Safety Devices Cut Thefts**—The use of safety devices is given as one of two causes by the St. Louis police for a decrease of 45 per cent in motor car thefts for the first seven months of 1919, as compared with the same period last year. Up to Aug. 1 835 motor cars were stolen, of which 850 have been recovered. In the same period last year, 2241 cars were stolen, of which 1373 were recovered. The other reason for the decrease is the activity of the police.

**Motorcycle Cops Take It Easy Now**—Motorcycle police, New Orleans, La., are beginning to wonder if they are going to have to hunt new jobs; speeding has fallen off to such a great extent since prohibition went into effect. Corp. Harry Duvalle, whose post is on the Shell Road, leading to West End and Bucktown, the two principal centers of former cabaret delights, has reported to the superintendent of police that few cars are on the road after 10:30 p. m., that there is no speeding. Early in the evening there is no hard driving, and later, at the time when the speedsters used to be abroad, the road is virtually deserted. Arrests average about 1 to 4 as compared with the nights before July 1.

**Motorists to Be Protected Also**—Motorists driving in New York state will not run the danger of being blinded by glaring headlights on electric cars after 1919 as a

result of the passage by the state legislature of the McWhinney law. This law forbids the use of glaring headlights on surface cars when operating upon or at the side of any public highway or street.

**Legislature Allots Money for Road Up-keep**—One of the last acts of the Pennsylvania state legislature before adjournment was to place at the disposal of the state highway department a fund of \$61,117,388. This fund will be used for road building and maintenance this year and next.

**Quebec to Keep Up Good Road Work**—The development of good roads in the Province of Quebec is likely to occupy much of the stage at the next session of the Quebec legislature. Now that the war is over, transportation is one of the great problems of this continent, and Quebec shows signs that it is not going to lack any initiative in the development of the work for good roads which has already brought out such splendid results. Quebec is the pioneer in the development of good roads in this Dominion. In the five years from 1911-12 to 1915-16, the Quebec government spent \$15,774,369 for good roads. The results are evident in every part of the province. The work has become so important that in 1912 a new department of roads was created, with a minister of roads in charge of it.

**How Missouri Does It**—The secretary of state of Missouri is supplying copies of application of transfer of certificate of registration, with copy of the law concerning such transfer. The law says that when a motor vehicle is sold, the seller shall write his name on the back of his registration certificate; the buyer shall write his name under that of the seller, both signatures to be written in the presence of an officer qualified to take acknowledgment of deeds, such officer to sign as wit-

ness. The seller shall then notify the secretary of state of the name and address of the buyer, and the buyer shall within five days inform the secretary of state of his purchase, giving name of seller and business address, if known, and the number under which the vehicle is registered. The buyer also sends the secretary of state 50 cents and the certificate with its signatures—and the secretary notes the change of ownership on the registration books, and endorses the transfer on the certificate. Certificates of registration must be shown, under the law, to any peace officer who asks to see them.

**Texas County to Spend Million on Roads**—Orange County, Texas, highway executives are daily expecting the arrival of engineers from the company with which contracts have been closed involving the immediate expenditure of \$1,000,000 in the improvement of roads. The money has been provided by bond issue, and the first work to be done will be the improvement of the highway between Beaumont and Orange, to relieve the upper roads during the winter months when traffic between the two cities is heaviest.

**Jail for Headlight Evaders**—Judge Thomas P. Riley of the Malden district court has sent out a warning to all motorists who are not living up to the headlight law in Massachusetts who are brought before him and convicted that he will impose no more fines but will sentence every one of them to jail for at least 24 hr. He states that any motorist who wilfully disregards the law by even refusing to rub some soap on his lenses is unworthy to be allowed to drive a car on the highways. As there is much traffic through Malden going to and from the north shore, it is expected that there will be a change for the better in his district.

**New Orleans Teaching Mechanics**—Loyola University, New Orleans, La., has opened its school of mechanics Aug. 1. The course is ten weeks, and the men will be taught to rebuild a car from the ground up, to make temporary and permanent repairs, to paint and upholster and to do such temporary electrical work as needed if unable to reach a garage.

**Suits to Collect War Plowing Bills**—Suits growing out of claims for wartime plowing of Pennsylvania farms by tractors operated by the state council of public defense, have been begun in Dauphin County Court by the Attorney General's department, against farmers in Dauphin, Chester, Northampton, Allegheny and Montgomery counties. Some bills have been paid and others are in dispute. When the war began, the State purchased thirty-five tractors which were made available for use on farms of those contracting for the service and which did not carry any profit for the State. It was stated at the time that the movement was for the purpose of stimulating food production throughout Pennsylvania. The bills were objected to as too high and all efforts at compromise have failed.

## Coming Motor Events

### TRACTOR DEMONSTRATIONS

Los Angeles, Cal.....	Regional Demonstration.....	September
Streator, Ill.....	Northern Illinois Association.....	Sept. 9-12
Ottawa, Ontario.....	Tractor and Farm Machinery.....	Oct. 14-16

### RACES

Uniontown, Pa.....	Speedway.....	Sept. 1
New York.....	Speedway.....	Sept. 20
Cincinnati, Ohio.....	Speedway.....	Oct. 1

### SHOWS

Toronto, Canada.....	Canadian National Exhibition.....	Aug. 23-Oct. 6
Greenville, S. C.....	Farm Implements and Tractors.....	Sept. 1-6
Cincinnati, Ohio.....	Automobile Dealers' Association.....	Sept. 13-20
Springfield, Mass.....	Eastern States Exposition.....	Sept. 15-20
Waterloo, Iowa.....	Black Hawk County Motor Trades Bureau.....	Sept. 22-28
Detroit.....	Dealers' Association, closed car salon.....	Oct. 6-11
Chicago.....	Automotive Equipment Association.....	Nov. 3-5
New York.....	N. A. C. O.....	Jan. 3-10
Chicago.....	N. A. C. O.....	Jan. 24-31
Kansas City, Mo.....	Kansas City Tractor Club.....	February
Wichita, Kan.....	Wichita Thresher-Tractor Club.....	Feb. 9-11



# The Contented Driver

**E**ASY steering makes Contented Drivers. It conserves human strength and increases efficiency in both driver and truck. It means a bigger day's work more easily done and greater satisfaction to both the owner of the truck and the man who drives it.

This Contented Driver is only one of 140,000 who go to their homes after a better day's work with lighter hearts and with less wearied bodies, because the trucks they drive are equipped with

## ROSS STEERING GEARS

The special feature which distinguishes Ross Gears from all others is the screw and nut mechanism which transfers the action of the steering wheel to the steering arm. The nut is a solid piece, completely enveloping the screw, so that the enormous bearing surface on the threads of both screw and nut is utilized with every turn of the wheel.

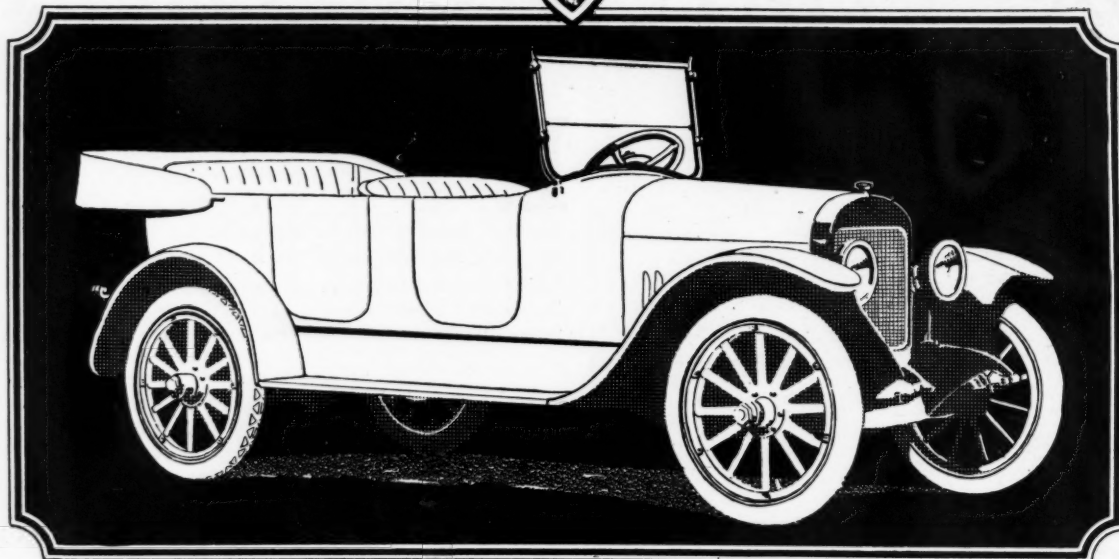
These bearing surfaces not only make steering easy under all conditions, but they guarantee an unusual degree of safety and reliability.

Ross Steering Gears are now used as standard equipment by 120 different manufacturers, representing considerably over half the entire motor truck industry.

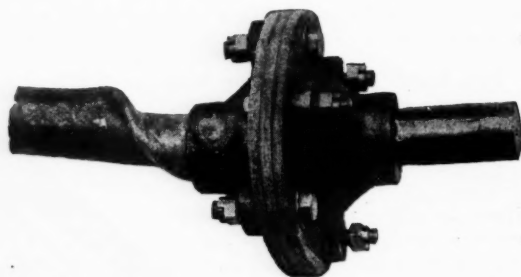
*Write for catalog and any other information desired about "The Steering Gears that Predominate on Motor Trucks."*



**ROSS GEAR & TOOL COMPANY, 400 Heath St., Lafayette, Ind.**



## A Universal Joint of Proved Strength



This photograph shows the results of a test made with a Thermoid-Hardy Universal joint at Purdue University. A 2-in. 10 gauge tubular propeller shaft was twisted at a total stress of 21700 inch pounds, without injuring the joint. The sturdy Thermoid-Hardy Universal Joint, incorporated in the Crow-Elkhart, eliminates road shock on transmission, driving shaft, and differential. It transmits the impact from the Multi-Powered motor in a smooth even flow of power to the rear wheels.

# CROW-ELKHART Multi-Powered

Crow-Elkhart 1920 Six—5 Pass. Touring Car, \$1545; 1919 Six—5 Pass. Touring, \$1345; Six—2 Pass. Roadster, \$1345; Six—5 Pass. De Luxe Tourster, \$1405; Six—4 Pass. De Luxe Roadster, \$1405; Crow-Elkhart Four—5 Pass. Touring, \$1145; Four—2 Pass. Roadster, \$1145; Four—5 Pass. De Luxe Tourster, \$1205; Four—4 Pass. De Luxe Roadster, \$1205.

*Write for catalog containing full information.*

CROW-ELKHART MOTOR CORPORATION, Dept. 101, ELKHART, INDIANA  
Export Department, Broadway at 53rd Street, New York City, U. S. A.

Dealers will immediately recognize the new opportunity that the Crow-Elkhart Multi-Powered Line offers. Desirable territory is still open. *Write today for particulars about our attractive dealer franchise.*



# MICHELIN

## AN OPPORTUNITY

Notwithstanding the popularity of Michelin Tires, there are some towns where dealers can still secure this valuable account.

In these towns we offer the following:

**1st**—A thoroughly tested cord tire, made by the oldest pneumatic tire maker in the world.

**2nd**—A fabric tire of unsurpassed quality sold at a moderate price.

**3rd**—The only ring-shaped tube on the market—a tube that sells itself.

**4th**—One of the biggest and most impressive tire and tube advertising campaigns ever conducted.

**5th**—Special sales helps for individual dealers.



We invite you to write us now.

## MICHELIN TIRE COMPANY

Milltown, New Jersey



IT is unusually significant that a big majority of the manufacturers of better cars, specify Hayes Wire Wheels as their standard wire wheel equipment. It is, of course, almost universally recognized that the Hayes is infinitely smarter.

That, alone, would be sufficient reason why Hayes Wire Wheels are so widely preferred by owners of *all* types of cars. But durability, safety and fine workmanship are even greater consideration

among motor car engineers and manufacturers.

For instance, actual service shop records show that spoke replacements, in the Hayes—and spokes are almost the only parts that are ever broken—are less than 50 per cent of those in other construction.

Hayes service stations in some cities regularly supply Hayes spokes to many users of other wheels, because their superiority is recognized.

Hayes Wire Wheels are the only ones with enclosed driving studs.

Engineers largely base their preference on this feature, because enclosed driving studs give a greater factor of safety, in 20 per cent to 25 per cent greater driving bearing service.

*DEALERS: Wheels which most of the manufacturers specify as equipment for their cars are good wheels to sell. Write for our exceptional dealer proposition.*

Wire Wheel Division **Hayes Wheel Company** Jackson, Michigan  
World's Largest Builders of Wheels—Wire, Wood, Steel

#### Distributors:

Motor Equipment & Tractor Co.  
1310 S. Grand Ave., Los Angeles, Calif.  
C. H. Carter  
724 Van Ness Ave., San Francisco, Calif.  
Broadway Tire & Rubber Co.  
Oakland, Calif.  
Automotive Supply Co.  
1558 Broadway, Denver, Colo.

Brigman Motor Sales Co.  
491 Whitehall St., Atlanta, Ga.  
Chicago Wheel & Rim Co.  
2010 Wabash Ave., Chicago, Ill.  
Mitchell & Smith, Inc.  
1090 Commonwealth Ave., Boston, Mass.  
Siggins Sales Company  
106-108 Milwaukee Ave., Detroit, Mich.

Auto Marine Service Co.  
1027 Nicollette Ave., Minneapolis, Minn.  
Hayes Wire Wheel Sales Corporation  
842 Seventh Ave., New York, N. Y.  
Samuel Scott  
2038 Ranstead St., Philadelphia, Pa.  
Miller & Woodward  
3751 Bigelow Blvd., Pittsburg, Pa.

# HAYES Wire Wheels



# EUREKA LINERS

The only perfect transmission brake liners for Ford Cars



Showing where and how the Eureka Liners are inserted.

A thoroughly tested device for relining transmission brake bands in Ford cars without replacing any of the original Ford equipment or disturbing the proportion and perfect mechanical balance of the car. Inserted between the Ford brake band and drum.

## Eureka Liners

are merely slidable bands of tough, half-hardened cold rolled steel with friction facing or fabric securely riveted together.

Easily installed. You can reline one brake band as needed at any time or any place, in just a few minutes' time.

**Guaranteed to give perfect satisfaction under all conditions.**

**DEALERS:** Eureka Liners enable you to save extra labor costs—do more business in less time—and make more money per unit sale than is ordinarily made through the sale of brake lining and the accompanying labor cost. Will sell on sight. Get our proposition today.

*Write for descriptive circular and dealer's proposition.*

Manufactured exclusively by

**THE EUREKA  
SALES CO.**

**GEORGE BLDG.**

**PITTSBURGH, PA.**

Eureka Sales Company,  
Pittsburgh, Pa.

Check  
here

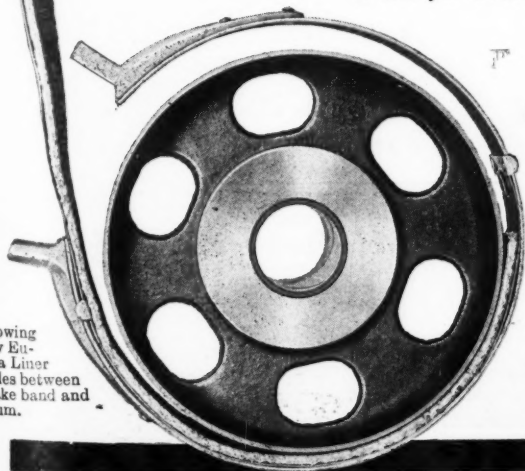
Send dealer's proposition ☐

Send.....sets of Eureka  
Liners parcel post collect. ☐

Name .....

Address .....

Showing  
how Eu-  
reka Liner  
slides between  
brake band and  
drum.



# Bijur

## Starting & Lighting Systems

*Standard  
Equipment  
on the  
Winton*



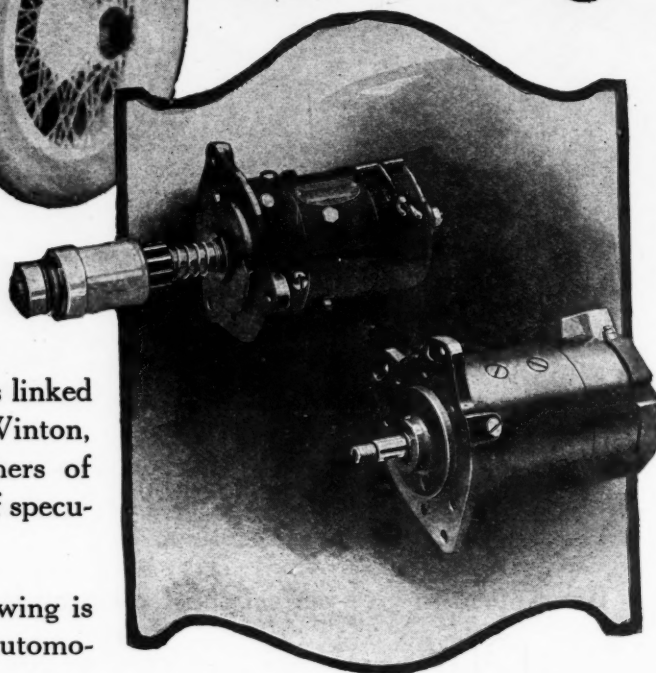
## Recognition

**W**HEN a starting and lighting system is linked up with such names as Packard, Winton, Marmon, National, Peugeot and others of the same quality, its quality is not a matter of speculation.

That Bijur is able to command such a following is ample indication of the place it occupies in automotive opinion.

Add to this its adoption by the Army and Navy for airplanes, seaplanes, blimps and tanks, and you have a collective endorsement that places the Bijur System in a premier position in the automotive field.

It needs nothing but its own performance to show why it is winning the substantial support of the world's best engineering minds.




---

The Bijur Starting and Lighting System is in Service on

*Passenger Cars  
Motor Trucks  
Motor Boats  
Seaplanes  
Dirigible Balloons  
Tanks*

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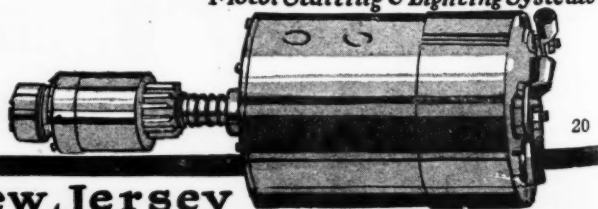
# Bijur Motor Appliance Company

Hoboken



New Jersey

*Motor Starting & Lighting Systems*





# PRESTO -FELT

## The Windshield Cleaner You Have Wanted

Once Over Does the Trick in Any Rain or Snow  
Scientifically Perfect — "It's in the Felt"

### One Cleaner for Any Windshield or Any Car

Presto-Felt Cleaners are made of chemically treated felt, which deposits a chemical film on glass, insuring a clean windshield and a clear vision in any storm. No need to drive blindfolded. A "PRESTO-FELT" affords sensible insurance against accidents. A vital necessity for every auto driver.



Here the Cleaner is shown bolted directly through the glass. Rubber buffer prevents breakage.

#### Fits Tight—Can't Rattle Cleans Both Sides at Same Time

Holders are made of oil tempered spring steel, giving uniform tension, and positively prevents rattling. One cleaner fits any type of windshield;—clamps over top—bolts through the frame or through the glass.

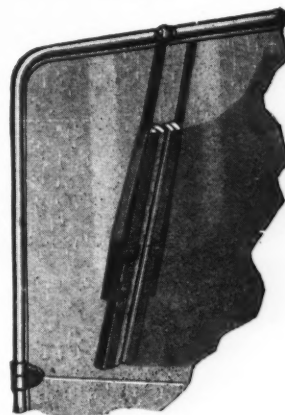
Special roller attachment permits cleaner to slide on windshield, cleaning full width of glass. All necessary parts furnished without additional cost. Patented attachment operates both sides at same time. Satisfaction guaranteed.

**Price \$2.00**

At your dealers, or sent direct on receipt of price and your dealer's name.

**Dealers Wanted Everywhere**

Write for details and special proposition.



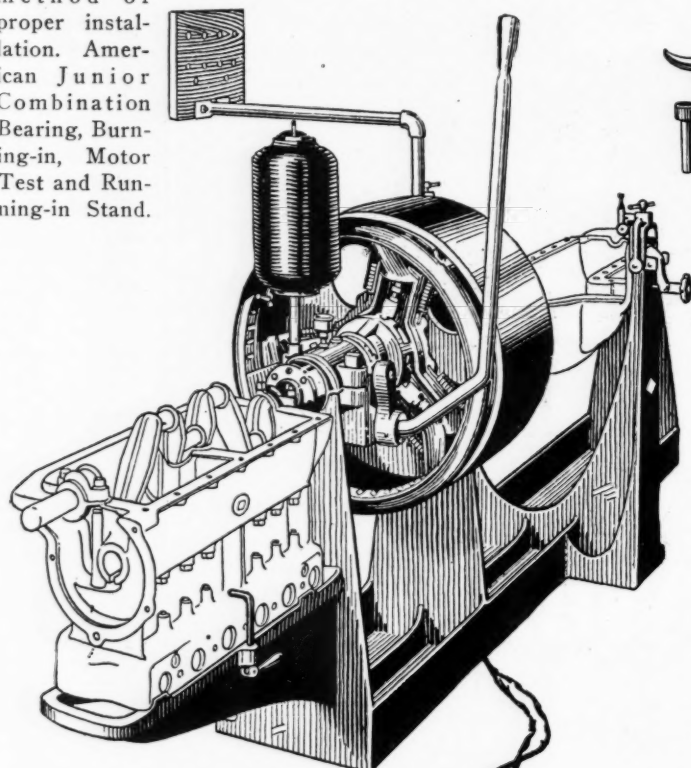
This shows how Cleaner is attached by bolting through frame of windshield.

Illustration at top shows how Cleaner is attached over top of windshield frame.

**Presto Felt Mfg. Co. 120 N. Erie St. Toledo, Ohio, U.S.A.**

Eastern Office No. 2 Park Square, Boston, Mass.

\$197.50 F.O.B. Chicago, including gasoline tank, coil box holder, water connections and a set of blue prints showing method of proper installation. American Junior Combination Bearing, Burning-in, Motor Test and Running-in Stand.

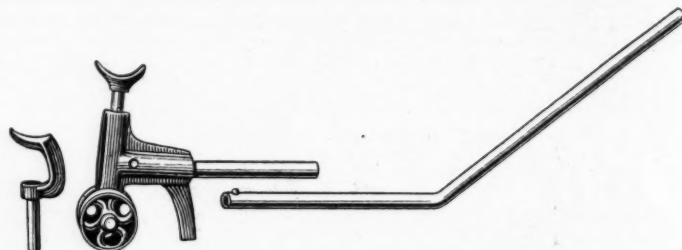


**\$197.50**  
F. O. B. Chicago



AMERICAN JUNIOR COMBINATION BEARING, BURNING-IN, MOTOR TEST and RUNNING-IN STAND

Saves 5 to 7 hours over the hand-scraping method in renewing a set of Ford Motor bearings. Gives to bearings a 95% bearing surface.



The Jiffy Garage Jack

This jack raises one wheel at a time. Tire changes and adjusting of bearings are accomplished in a few seconds. Price \$8.00.

## Labor-Saving Machines and Tools Mean More Profits to Service Stations

The more cars sold each year, the more repair work must be done. It is not possible for any one service station to meet the repair demands with ordinary equipment.

Ordinary equipment takes too much time. And that causes dissatisfaction with the car owners. Profits are small.

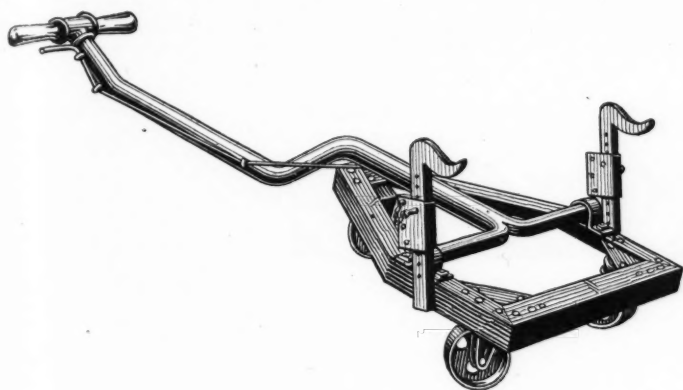
If you are a progressive service station man, you want to keep up with the times.

Therefore, be prepared to reap the full benefits of prosperity by looking carefully into the possibilities of the Fairbanks lines of labor and time-saving repair machines and tools.

*The*  
**FAIRBANKS**  
Sole Distributors for the SERVICE STATION EQUIPMENT CO. *Company*  
and other manufacturers of garage equipment.



MILL, MINE AND RAILWAY SUPPLIES, SCALES, VALVES, POWER TRANSMISSION, TRUCKS AND WHEELBARROWS



### Tucker Quick Action Adjustable Jack Truck

Can be adjusted in an instant to any size car. Practicable for quick change of tires, putting on chains, adjusting brakes, turning cars and placing cars in crowded garages. Price \$22.50.



### Quick Easy Ford Jack

Quickest jack that there is for lifting Fords. One down stroke of the handle and the car is raised. Price \$16.00.

## Guaranteed by "The Fairbanks Company O. K."

You cannot go wrong in buying Fairbanks equipment. Each piece of equipment is guaranteed by "The Fairbanks Company O. K."

85 years of reputation and experience are behind this guarantee. All equipment must be right before it can meet the rigid requirements of "The Fairbanks Company O. K."

Think the matter over carefully and write the nearest Fairbanks Branch House for detailed information.

Do it now. This equipment is in big demand. Don't wait until it is too late for quick deliveries.

### THE FAIRBANKS COMPANY

ADMINISTRATIVE OFFICES:—New York

#### BRANCH HOUSES

Albany	Chicago	New York	Rochester	Washington
Baltimore	Detroit	Paterson	Scranton	Havana, Cuba
Birmingham	Hartford	Philadelphia	St. Louis	London, England
Boston	Newark	Pittsburgh	Syracuse	Birmingham, England
Bridgeport	New Orleans	Providence	Utica	Glasgow, Scotland
Buffalo				Paris, France

Listed below are many other labor-saving and profit-making machines and tools which should interest every Ford Service Station owner. All these machines and tools are sold under "The Fairbanks Company O. K."

Bearing Burning-in Machines for Fords and Fordsons  
Motor Test Stands  
Engine and Axle Stands  
Bearing Boring Machines and Re-Babbiting Jigs  
Cylinder Boring Machines for Fords and Fordsons  
Straightening Presses  
Arbor Presses  
Power Grinders  
Air Compressors  
Transmission Reaming Machines  
Special Ford Reamers  
Rear Axle Sleeve Pullers  
Radiator Test Plugs  
Piston Clamps  
Connecting Rod Straightening Jigs  
Bench Motor Clamps  
Transmission Drum Clamps  
Rear Axle Pinion Gear Presses  
Pinion Gear Pullers  
Piston Bushing Reamers  
Crank and Cam Shaft Testing Machines  
Emergency Wheel Clamps  
Wheel Pullers  
Valve Port Renewing Tools  
Bushings Drivers  
Turning Bars  
Speed and L Wrenches  
Special Jacks  
Rim Tools  
Tow Bars  
Combination Electric Drills and Valve Grinders  
Visible Measuring Gasoline Pumps  
Special Ford and Fordson Tools

The  
**FAIRBANKS**  
Sole Distributors for the SERVICE STATION EQUIPMENT CO. *Company*  
and other manufacturers of garage equipment.



MACHINE TOOLS, ENGINES AND PUMPS, AUTOMOBILE AND SERVICE STATION EQUIPMENT



Very shortly an announcement of considerable importance to the automotive industry will be made in these pages by the Savage Arms Corporation— an announcement concerning



# SAVAGE

*a product that will mark as  
great an advance in design  
as has yet been recorded in  
automotive parts history*

SAVAGE ARMS CORPORATION  
SHARON, PA.

UTICA NEW YORK DETROIT PHILADELPHIA



In a  
class  
by  
itself

Sportster



#### Specifications

Four-cylinder models have powerful long stroke Elcar-Lycoming motor, developing 37½ horsepower at 2,100 r. p. m. Six-cylinder models have Red Seal Continental 3¼x4½ inch engine developing 40 horsepower at 2,100 r. p. m. Outside the power plants the Elcar Sixes and Fours are practically the same. Two unit electrical system. Long wheelbase, 116 inches. Road clearance 10½ inches. Full floating rear axle with spiral bevel driving gears. Timken Roller Bearings in front and rear wheels. Double universal drive; tubular propeller shaft. Copper cellular radiators. A wonderfully easy riding semi-elliptic spring suspension. Roomy and comfortable bodies of beautiful design and durable finish; new "Cathedral Pipe" upholstery. Equipment complete, even to motometer on radiator.

#### 1919 Prices

##### Four-Cylinder Models

- 5-Passenger Touring \$1225
- 4-Passenger Roadster \$1225
- 4-Passenger Sportster \$1225
- 5-Passenger Sedan \$1775

##### Six-Cylinder Models

- 5-Passenger Touring \$1475
- 4-Passenger Roadster \$1475
- 4-Passenger Sportster \$1475
- 5-Passenger Sedan \$1995

# ELCAR

**Conspicuous for its  
high value and low price**

Some cars stand out for their special design—others for their low price—but ELCAR is a well balanced car.

Its striking beauty of design is backed by built-in excellence that makes the Elcar a distinct leader for VALUE.

#### Exclusiveness with Economy

Like all ELCAR models, the Elcar Sportster is practical as well as strikingly good looking. The motor is speedy and powerful—flexible and easy to handle. You can run the Elcar an average of 18 to 20 miles to a gallon of gasoline, 1,000 miles to a gallon of oil. Every part is built 150% strong for long, hard service.

Elcar owners are Elcar's most enthusiastic endorsers.

Dealers: If the agency in your territory is one of the few still open, write us for particulars.

**Elkhart Carriage and Motor Car Company**

781 Beardsley Ave., Elkhart, Ind.





*"My  
Recommendation!"*

# Why Are 8 Out of 10 Cars Gilmer Equipped?

## *The Answer is Very Simple*

**8** OUT OF 10 CARS built today are equipped with GILMER Woven Endless Fan Belts when they leave the factory. 8 out of every 10 cars built are Gilmer equipped—*think of it.*

It is particularly significant that so many different car and truck manufacturers should all agree on one make of Belt, for each manufacturer conducts his own private laboratory experiments and road tests to determine fan belt merit. Furthermore, if price were a factor, no car manufacturer would use Gilmer Belts—not ONE, for, of all woven belts built, Gilmer Belts are the most expensive for the manufacturer to buy for equipment purposes.

Only a Fan Belt that resists heat, moisture and oil without slipping, sticking, losing its shape, shrinking, stretching or separating, will render 100% *continuously* efficient service.

### *Heat, Oil and Moisture Are a Fan Belt's Worst Enemies*

Heat, oil and moisture are a Fan Belt's worst enemies. That is why you cannot judge Fan Belt value by appearance, weight or feel.

Avoid buying a belt that merely looks or feels "good." Oil, mois-

ture and the oven-like heat under the hood may soon rob it of its efficiency.

The scientific process of treating woven belting, developed by Gilmer Engineers, avoids the use of rubber and other compounds that cannot resist heat, oil and moisture. This scientific process is used exclusively in the production of Gilmer Woven Belting.

Laboratory tests show that the Fan Belts which go to pieces quickest are those made of rubber and other compounds which cannot resist heat, oil and moisture.

### *Gilmer Belts Resist Heat, Oil and Moisture*

That Gilmer Belts do resist heat, oil and moisture perfectly in service can be graphically demonstrated by a heat and water test. Gilmer Belts are not affected by either test. Ordinary Belts are.

As long as the best costs so little to buy, can you afford to take a chance on a belt that may not perform properly on your car? Follow the manufacturers' choice. They know. Insist upon a genuine Gilmer Belt and avoid the possibility of trouble and annoyance on the road.

Every belt now plainly marked with the name "Gilmer." Leading dealers everywhere carry assorted stocks to fit all cars using flat type belts.



## L. H. Gilmer Co., Philadelphia, Pa.

### **FACTORIES:**

Philadelphia, Pa.

North Wales, Pa.

Millen, Ga.

### **BRANCH OFFICES:**

Chicago Detroit Milwaukee

### **EXPORT OFFICE:**

136 Liberty Street, New York



# Gilmer

WOVEN ENDLESS  
FAN BELTS

# Gilmer

WOVEN ENDLESS FAN BELTS

Woven Endless  
Fan Belts for

J. H. GILMER CO., PHILADELPHIA, PA.

GROUP 3		
MAKE	YEAR	MODEL
Allen	1915-16-17-18-19	34-37-41
Buick	1914	B36-B37-B38-B54 B55
Buick	1915	C24-C25-D36-D37 C54-C55
Buick	1916	D54-D55
Chandler	1916-17-18-19-20	All Models
Dodge	1917-18-19-20	6A-45
Geronimo	1918	

Gilmer GROUP 3

Gilmer GROUP 3

Gilmer GROUP 3

Gilmer GROUP 3

## WOVEN ENDLESS FAN BELTS

"Bilt to Fit," there is an exact, scientifically correct size for most car makes and models using a flat type belt. Your car and model is probably listed in one of the following twenty-six groups. To be sure of getting the right—and best—fan belt, simply ask the dealer for a "Gilmer Woven Endless Fan Belt, Group So-and-so."

GROUP 1			PRICE \$ .50
MAKE	YEAR	MODEL	
Ford	1911-16	T	
National	1917-18-19	Highway 12	
Stearns	1919-20		

GROUP 2			PRICE \$ .50
MAKE	YEAR	MODEL	
Ford	1917-18-19-20	T	

GROUP 3			PRICE \$ .75
MAKE	YEAR	MODEL	
Allen	1915-16-17-18-19	34-37-41	
Buick	1914	B36-B37-B38-B54 B55	
Buick	1915	C24-C25-D36-D37	

GROUP 12			PRICE \$ .75
MAKE	YEAR	MODEL	
Anderson	1916-17-18-19-20	With 7W Motor	
Davis	1916-17-18-19	6-18	
Detroit	1917		
Chandler	1914-15	All Models	
Columbia	1918-19	Continental Motor	
Haynes	1915-16-17-18-19	30-46	
Liberty	1916-17-18-19	"6"	
Paige	1915	6-36	
Paige	1916	6-38	
Paige	1917-18	6-39	

GROUP 13			PRICE \$1.00
MAKE	YEAR	MODEL	
Reo	1915-16-17-18-19	M & N 6 cyl.	

GROUP 14			PRICE \$ .75
MAKE	YEAR	MODEL	
Maxwell	1915	22-25 S-H Starter	

GROUP 15			PRICE \$ .75
MAKE	YEAR	MODEL	
Maxwell	1915	22-25 G & D Starter	

GROUP 16			PRICE \$1.00
MAKE	YEAR	MODEL	
Maxwell	1920	25	

GROUP 17			PRICE \$ .75
MAKE	YEAR	MODEL	
Biddle	1916-17-18-19	D & H	
Chalmers	1916-17-18-19	15-A-B-C-D	
Maitland	1917-18-19-20	H	
Case	1915-16	25-30	

GROUP 18			PRICE \$1.25
MAKE	YEAR	MODEL	
Monroe	1918-19-20	M-4	

GROUP 19			PRICE \$1.00
MAKE	YEAR	MODEL	
Mitchell	1920	E-42	

GROUP 20			PRICE \$1.00
MAKE	YEAR	MODEL	
Jeffery	1917	472	
Marmon	1916	34	
Mercer	1916-17-18-19	"A"	
Overland	1916	75	
Overland	1917-18-19	90 & 90 Country Club	
Roamer	1918	D4-75	
Templar	1917-18-19	4-45	

GROUP 21			PRICE \$1.00
MAKE	YEAR	MODEL	
Box	1919	20	

GROUP 22			PRICE \$ .75
MAKE	YEAR	MODEL	
King	1915-16	D & E	

GROUP 23			PRICE \$ .75
MAKE	YEAR	MODEL	
King	1917-18-19-20	EE F & G	

GROUP 24			PRICE \$ .75
MAKE	YEAR	MODEL	
Chevrolet	1916-17	490	

GROUP 25			PRICE \$ .75
MAKE	YEAR	MODEL	
	1916	6-46	
		6-51	
		6-55—First 4150 Cars	

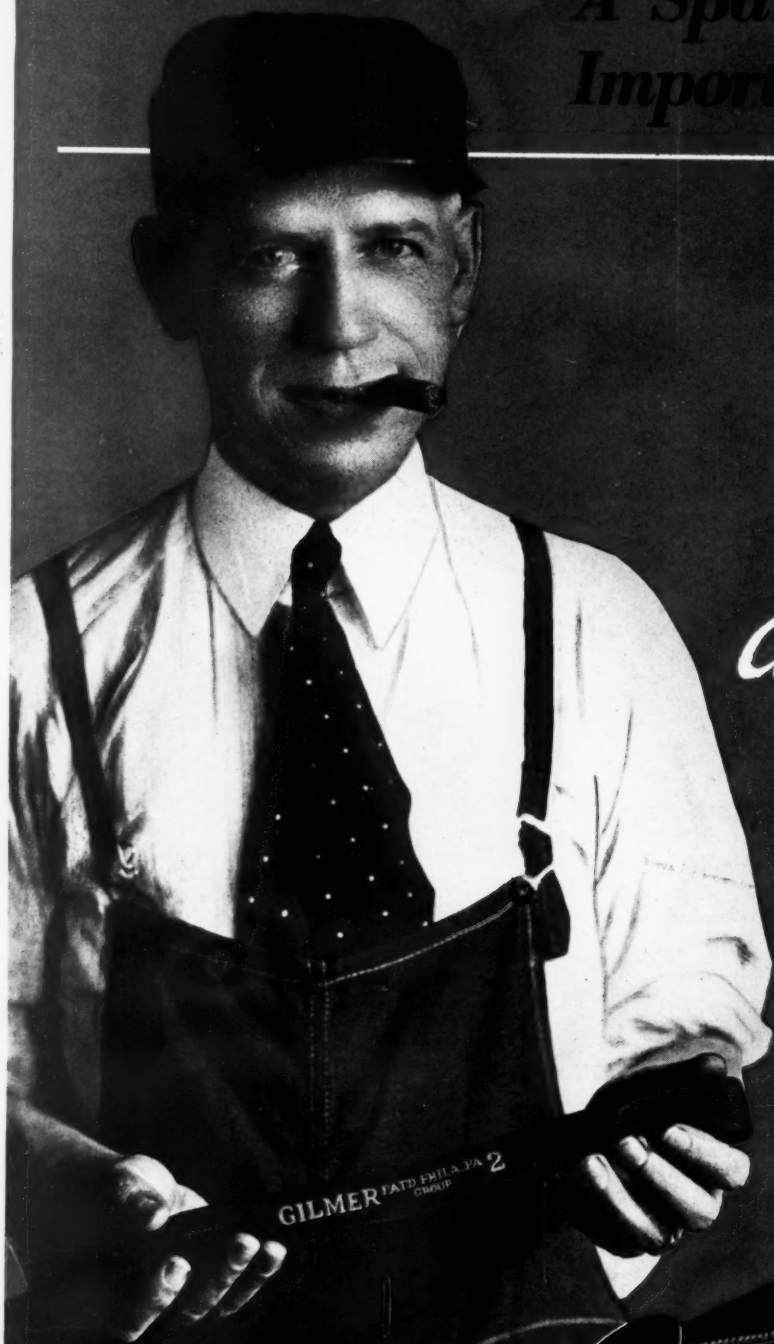
GROUP 26			PRICE \$1.00
MAKE	YEAR	MODEL	
		4150	
		42A	
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*"A Spare Fan Belt is as  
Important as a Spare Tire"*

Urge Your  
Customers to

*"Carry  
a Spare"*



*Gilmer*

*Gilmer*

WOVEN ENDLESS  
FAN BELTS



## Significance of ACME Sales Activity

FORESIGHTED distributors have sensed in the unusual sales activity of Acme Trucks something more deeply significant than is indicated by a progressive selling policy. They see in it also the recognition of Acme's dependability as proved in the long list of records which Acme has established in every industry.

*Today Acme sales are the highest in history—and still increasing.*

Acme gains its reputation for performance through the adoption of such units as Continental Motors, Timken Bearings, Axles and Drive, Cotta Transmission, with gears always in mesh, and all other units of equal grade, correctly assembled in a well-balanced truck.

**Built in 1, 2, 3½ and 5 ton Models**  
*Bodies built in our factories*

The growing popularity of the Acme, stimulated by one of the largest advertising campaigns in our history, presents the most active and profitable opportunity for the dealer. Dealers in open territory who can do justice to Acme are invited to investigate our unusual proposition. Write also for our book, "Pointers to Profits," containing the facts about the Acme.

Address Dept. 135

*The Seal of Dependable Performance*



*Trade Mark Registered  
 U. S. Patent Office*

**ACME MOTOR TRUCK COMPANY, CADILLAC, MICH.**



# BOSCH

**KEY TO MAP**

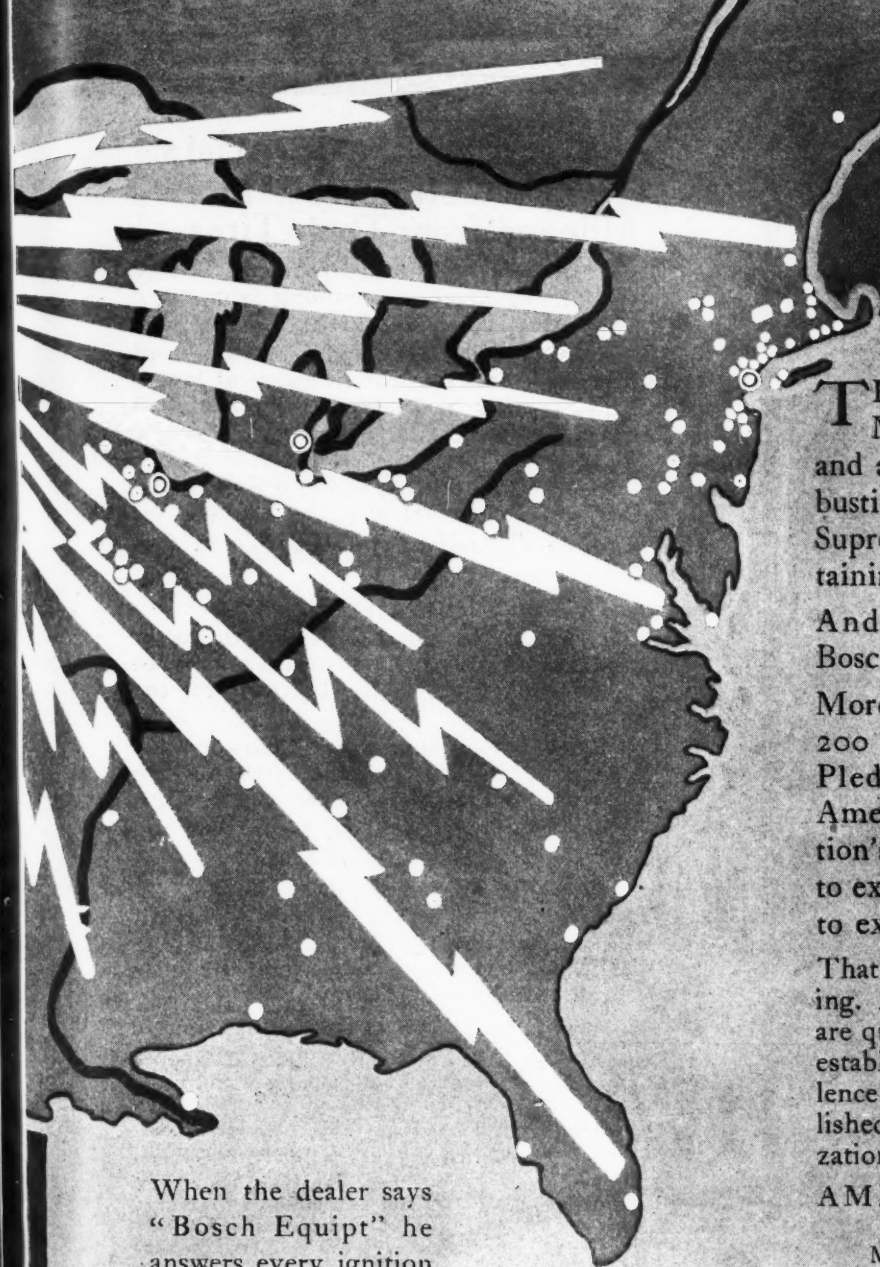
- Service Station
- ⊙ Branch
- Factory

**AMERICA'S SUPREME**  
MOTOR TRUCKS - TRACTORS - AIRPLANES - MOTOR CARS

BOSCH TYPE ZR6  
No. 000 000  
MADE IN U.S.A.



# SERVICE



When the dealer says  
"Bosch Equipt" he  
answers every ignition  
doubt in the mind of  
the buyer.

THE enduring reliability of Bosch Magneto Ignition is recognized and admitted wherever internal combustion engines are known. America's Supreme Ignition System needs no sustaining arguments.

And behind Bosch Supremacy is Bosch Service.

More than 200 Service Stations in over 200 cities are carrying out the Bosch Pledge of Responsibility. For the American Bosch Magneto Corporation's responsibility to its product ceases to exist only when the magneto ceases to exist.

That Bosch Service organization is growing. Highly developed technical men, who are qualified to give service from their own establishments, on the same plane of excellence that the Bosch Magneto has established, are being welcomed into the organization.

## AMERICAN BOSCH MAGNETO CORPORATION

Main Office and Works: Springfield, Mass.

Branches:

New York - Chicago - Detroit - San Francisco

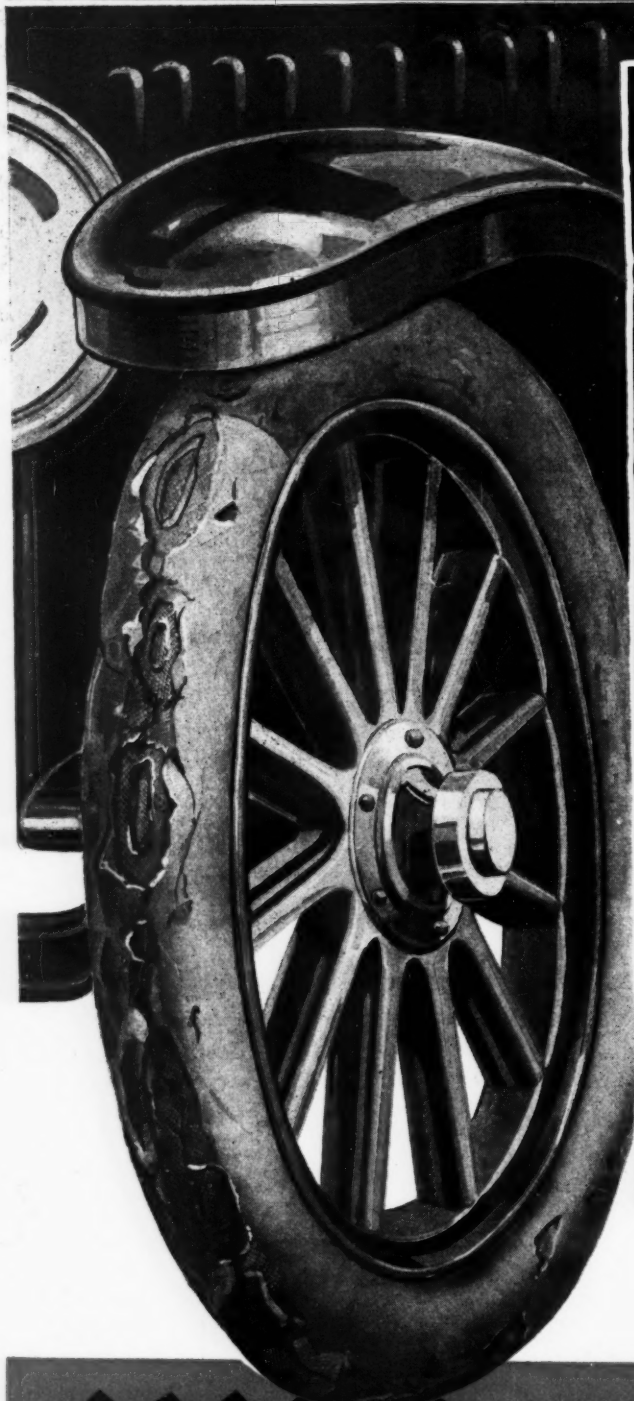
*More than 200 Service Stations in Over 200 Cities*

# IGNITION SYSTEM

MOTOR BOATS - MOTORCYCLES - GAS ENGINES - ETC.



# MAKE YOUR OLD TIRES AS GOOD AS NEW



## Thousands of Motorists Are Now Getting 75% More Mileage from Their Tires

**Y**OU can reduce your tire cost per mile to one-third as much by remiling your worn tires with the Miller AD-ON-A-TIRE.

The Miller AD-ON-A-TIRE is built of tough, buoyant rubber. It has several layers of fabric, breaker strip, tread and side wall which completely cover the tire, and clinch under the rim.

Once on, it becomes an integral part of the tire. And the AD-ON-A-TIRE has the famous Miller **Geared-to-the-Road** Tread that assures perfect traction.

### Don't Risk Makeshifts

Don't run on the carcass of your tire after the tread has worn off. That means a blowout long before your tires should be ready for the scrap heap.

Don't depend on makeshift repairs. None of them offer an insurance of extra mileage that warrants the repair expense.

*The Miller AD-ON-A-TIRE is the only tire remiler that guarantees you 100 per cent value from your tires.*

Thousands of motor car owners have kept careful books on tires remiled with AD-ON-A-TIRES, and in every instance their tire costs have been reduced two-thirds.

### Make This Test

Look for the Miller AD-ON-A-TIRE Dealer in your city. He will remile your worn tires and make them as good as new.

Then keep careful check on your mileage. Compare your total mileage with that of previous tires.

Only then can you appreciate the enormous tire savings the Miller AD-ON-A-TIRE makes for you.

# Miller AD-ON



# EVERY AD-ON-A-TIRE DEALER A SURE WINNER

## No Business Today Offers Dealers Such Guaranteed Sure Returns

**EVERYWHERE** Miller AD-ON-A-TIRE Dealers are making phenomenal sales records. We have not a single account on our books that is not showing remarkable monthly gains.

Here are the reasons why:

- 1—Motor car owners know that there is an enormous tire waste when the tire is run on the carcass after the tread is worn off. And that makeshift repairs are unprofitable.
- 2—The Miller AD-ON-A-TIRE is the only REAL tire remiler. It is the only remiler that satisfactorily solves the lower tire cost per mile problem. Motorists are quick to see the remarkable savings it makes for them. And regardless of the make of tires they originally preferred all select the Miller AD-ON-A-TIRE in preference to any other tire remiler. When it is considered that every car in your locality will use from 4 to 6 AD-ON-A-TIRES this year, the attractive demand for this new-day tire remiler can be appreciated. Absolutely no additional equipment is required.
- 3—We give our dealers a most complete agency proposition—attractive profits, and complete sales and advertising assistance, such as letter-heads, newspaper advertisements, folders, wall hangers, price-lists, etc. Nothing that will enable our dealers to acquaint the motor car owners in their territory with AD-ON-A-TIRE facts has been overlooked.

\* \* \* \* \*

These are the reasons for our present dealers' success. And they will be the reasons for YOUR success. Clip the coupon NOW for our folder, the New Big Money Maker. It will bring all the interesting facts to you.

### THE MILLER RUBBER CO.

Dept. A-218, Akron, Ohio

Makers of Miller Uniform  
Tires and Tubes,  
Accessories  
and Repair  
Materials



**CLIP THIS COUPON NOW**

**THE  
MILLER  
RUBBER  
CO.**

Dept. A-218,  
Akron, Ohio  
Gentlemen: With-  
out any obligation  
on my part, please  
send me your booklet  
"The New Big Money  
Maker."

Your Name .....

City..... State.....

I sell the following tires.....

I do only tire repair work.....

# -A-TIRE



## And Another Growing Prosperous Business—

Visualize the selling arguments that you could build upon the firm foundation of Bethlehem Engineering Superiority. Think of the jump that the husky, enduring Power Plant, the Internal Gear Drive, the superstrong Frame Construction, Electric Starting and Lighting, the Dependability that is inbuilt in every part of every Bethlehem, and the big Bethlehem Advertising Campaign gives you on the competitive field.

Write us for information about your territory and for the Bethlehem Cooperation Plan. It may mean the start of another growing, prosperous Bethlehem Business. And Bethlehem Business is Big Business.

1½ ton chassis  
**\$1965**

2½ ton chassis  
**\$2365**

3½ ton chassis  
**\$3465**

F. O. B. Allentown, Pa.

**BETHLEHEM MOTORS CORPORATION**  
ALLENTOWN, PA.

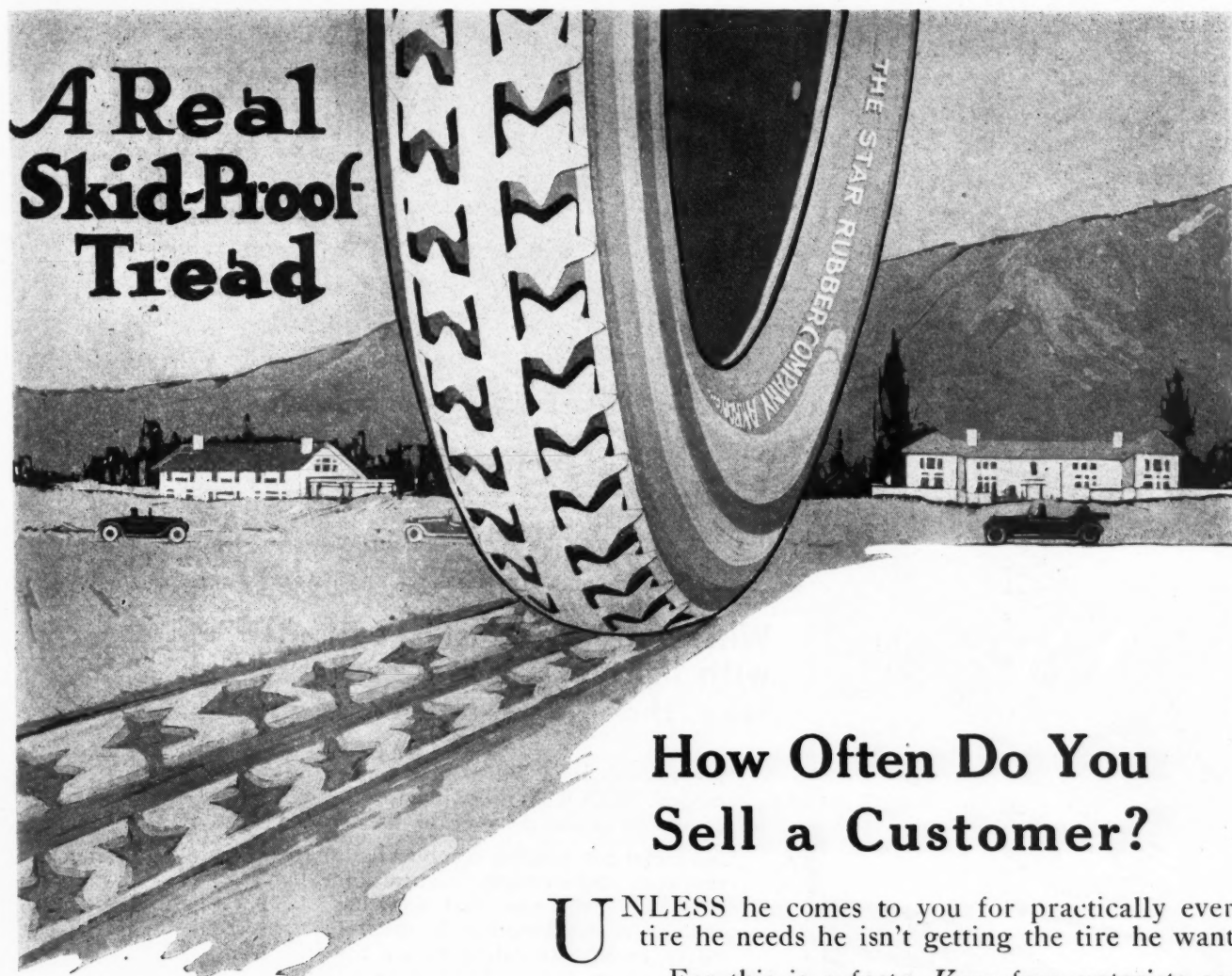


The Motor  
Truck bought  
to-day without  
Electric Starting  
and Lighting  
will be out-  
of date  
to-morrow

**BETHLEHEM**  
*Internal Gear Drive*  
**MOTOR ★ TRUCKS**  
*Dependable Delivery*

BETHLEHEM MOTORS CORP'N. ALLENTOWN, PA.

The Motor  
Truck bought  
to-day without  
Electric Starting  
and Lighting  
will be out-  
of date  
to-morrow



## How Often Do You Sell a Customer?

UNLESS he comes to you for practically every tire he needs he isn't getting the tire he wants.

For this is a fact. *Very* few motorists care to "shop around" for tires. If they "shop" it's evident they are still looking for the tire they can *depend* on to give them full value in mileage and service in exchange for their money.

Sell them *the dependable* tire and make steady customers of them. Keep them coming back to you for *all* the tires they need. That's *profitable* selling.

STAR *Hand-Made* TIRES are the answer. Want the details?

**Not Accidentally  
Good—But Made  
Good Always!**

**★THE STAR RUBBER COMPANY★**

AKRON'S MASTER TIRE BUILDERS  
1603 Crozier St., Akron, O.

**BRANCHES:**

New York: 226 W. 52nd St.  
Atlanta, Ga.: 328 Peachtree St.  
Kansas City, Mo.: 1922 Grand Ave.

# STAR CORD TIRES



**Where strength must be combined  
with lightness, metal can never  
take the place of WOOD**

Metal oars have been tried—and discarded. WOOD Wheels, like wood oars, cannot be replaced by metal.

No metal can possibly combine lightness, resiliency and strength. Nature alone, in WOOD, gives you that combination. And that combination is essential to safety, to smooth riding, to low tire and replacement cost. For "strength with elasticity" spells safety—"resiliency" means shockless riding—and "resiliency with lightness" results in the least possible wear on your car, its mechanical parts and its tires.

Experiments with other types of wheels are valuable only as the final proof of WOOD Wheel superiority.

**AUTOMOTIVE WOOD WHEEL  
MANUFACTURERS' ASSOCIATION**  
105 West Monroe Street Chicago, Ill.

**NOTE THE  
WOOD WHEELS  
EVERYWHERE**

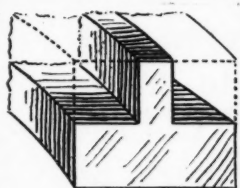
**WOOD WHEELS**  
*for* **MOTOR  
VEHICLES**





# TRIÖNE

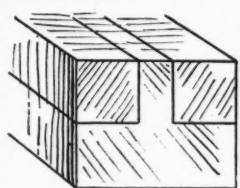
## The Three-Piece Snap Piston Ring



1

In simplicity of installation it is the snap ring—in effectiveness it is the snap ring tripled.

It is virtually three snap rings combined in one—three sturdy square cut rings. The three-piece piston ring, always best in theory, is now made practical in this three piece snap ring.



2

1

*The inner ring—the strength of any piston ring—is built like the angle beam support of heavy structure work.*

2

*The assembled ring, showing the broad surface against the cylinder and the impossibility of gas or oil blowing through the ring itself.*

*Many of the country's best jobbers are stocking Trione Piston Rings.*

SALES DEPARTMENT

**BAILEY-DRAKE CO., Inc.**

1120 South Michigan Ave.

CHICAGO, ILLINOIS

BRANCHES:

New York	-	-	N. Y.
Detroit	-	-	Mich.
Dallas	-	-	Texas
Atlanta	-	-	Ga.
San Francisco	-	-	Cal.
Kansas City	-	-	Mo.
Minneapolis	-	-	Minn.
Seattle	-	-	Wash.



Date \_\_\_\_\_  
**BAILEY-DRAKE CO., Inc.**  
 1120 South Michigan Ave. CHICAGO, ILL.  
 Gentlemen:—Send full information and prices on  
 Trione Piston Rings. Also a copy of your booklet.  
 Name \_\_\_\_\_  
 Street \_\_\_\_\_  
 Town \_\_\_\_\_ State \_\_\_\_\_ 1919

**Q** Leaf-spring breakage on cars and trucks averages about one spring per car per year.

**Q** The public is demanding a better spring than the original equipment.

The man with a broken spring has suffered loss and inconvenience. He feels entitled to know who makes the spring he buys. Every VULCAN Spring bears the VULCAN Nameplate, a mark of identification of which we are justly proud.

**Q** There is much profit for the dealer in giving the public what it wants.



**When springs break, put on**

**VULCAN**  
*QUALITY*  
*The Replacement Spring*

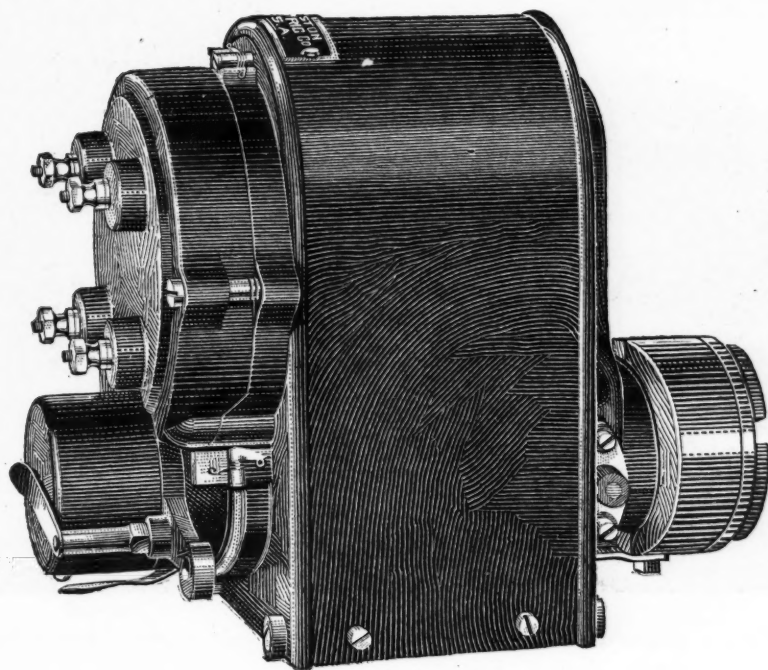
**Jenkins VULCAN Spring Co.**

**RICHMOND, INDIANA**

*Factory*

*Branches*

Atlanta, Ga.    Dallas, Tex.    Minneapolis, Minn.    St. Louis, Mo.  
Boston, Mass.    Kansas City, Mo.    Reading, Pa.



A more dependable magneto, with a hotter spark—a magneto that enables you to get that last atom of power from your fuel—a magneto that means long service, a magneto with a true automatic impulse starter—that is the time-tested Kingston.

# KINGSTON MAGNETOS

**THE KOKOMO ELECTRIC CO., Kokomo, Indiana, U. S. A.**

BRANCHES: New York City, 1733 Broadway; Chicago, 1430 Michigan Ave.; Detroit, 870 Woodward Avenue; Los Angeles, 501 W. Pico Street; Boston, 15 Jersey Street





*"There's a Brunswick Tire for Every Car—Cord, Fabric, Solid Truck"*

## Cord or Fabric— Just So They're Brunswicks!

### *For Long Distance Performance*

The builders of Brunswick Tires are men of skill and long experience. They are instructed to build the best tires possible.

Before the first Brunswick was produced they had already spent two years studying and analyzing all tires. The best features from each were selected. These were combined in The Brunswick.

And in the Brunswick laboratory today, experts are constantly endeavoring to build a still better tire. For the name of Brunswick must continue to stand for supremacy.

The highest standards of workmanship are met in our factory. Every bit of material is carefully tested. Only the very best is accepted. For the Brunswick policy

has always been to build only super-products.

For this reason Brunswick Tires assure maximum mileage. Whether you buy cord or fabric, you will find by actual test and comparison that no other tire gives greater value, regardless of cost.

And only a great organization, with nation-wide facilities for distribution, could offer such a superlative tire without increasing the price. The House of Brunswick is able to do so only because of this tremendous saving in the cost of distribution.

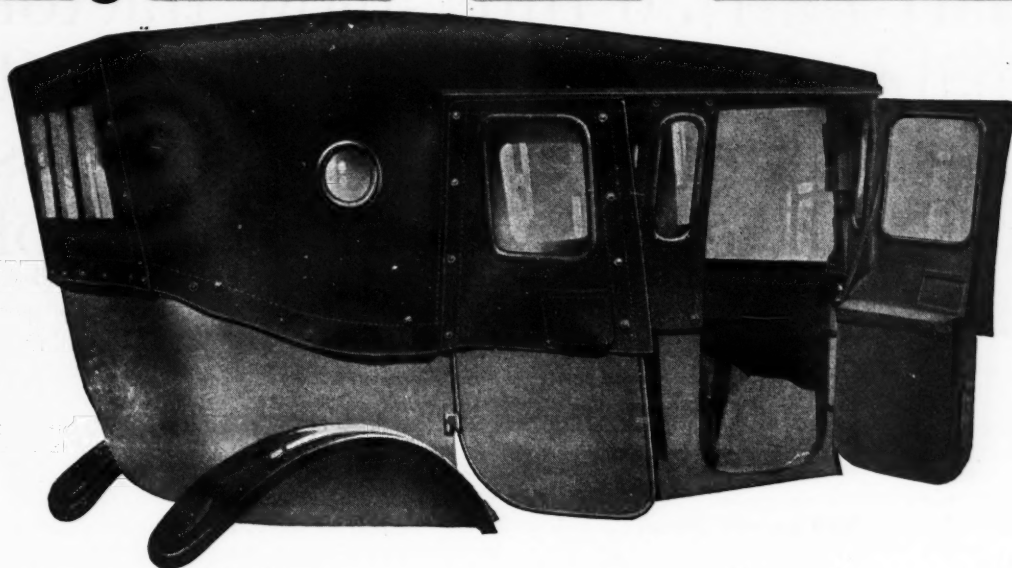
Dealers who handle Brunswick Tires have the co-operation of the great House of Brunswick with branches throughout the country. Write today for full particulars.

### THE BRUNSWICK-BALKE-COLLENDER COMPANY

General Offices: 623-633 South Wabash Avenue, Chicago

*Branches in the Principal Cities of United States and Canada*

# Prepare for Winter



## Baker "Over the Top" Auto Top

Designed for car owners who want protection against winter's cold, sleet and snow, and the chilly winds and rains of spring. For summer, the entire side panels are removed or re-installed in five minutes' time. The Baker "Over-the-Top" Auto Top is the most perfect

and substantial all-weather equipment on the market. Dealers find Baker "Over-the-Top" Auto Tops ready sellers because of superiority in design and workmanship. Order through your jobber or write for full description, prices, etc., addressing nearest office.

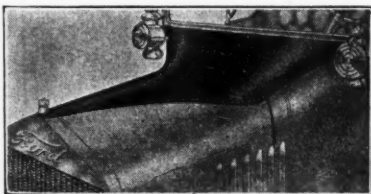
In addition to our complete line of Automobile Fabric Products, we also manufacture complete lines of Awnings, Tents, Paulins, Tractor Covers, Flags and other Fabric Products.

## BAKER AND LOCKWOOD MANUFACTURING CO.

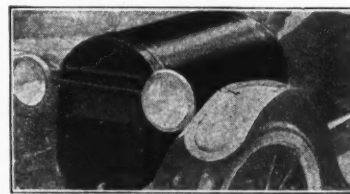
**Kansas City Factory**  
7th and Wyandotte Sts.

**Chicago Branch**  
3021-23 So. Michigan Avenue

**New York Factory**  
473-85 Kent Ave., Brooklyn, N. Y.



*Baker Rain Guards for Fords  
Prevent Rain Dripping on Wiring*



*Baker Hood and Radiator  
Covers All Cold Weather Necessities*

The tremendous power of the Hart-Parr 30 three-plow tractor enables Hart-Parr dealers to get the bulk of the tractor business in their territory in the face of any competition.

Some good territory open for dealers.  
Catalogue and information on request.

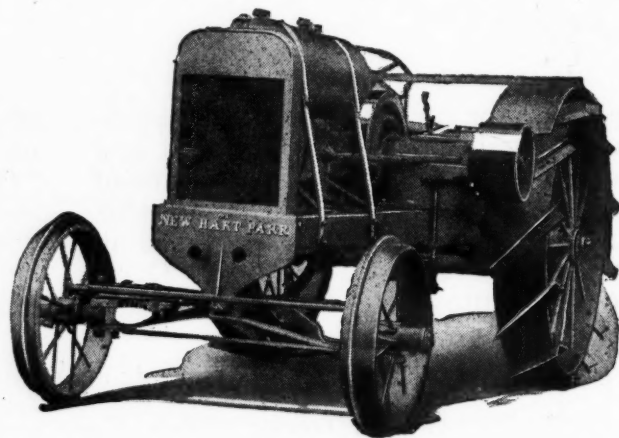
## HART-PARR COMPANY

Founders of the Tractor Industry

999 Lawler Street

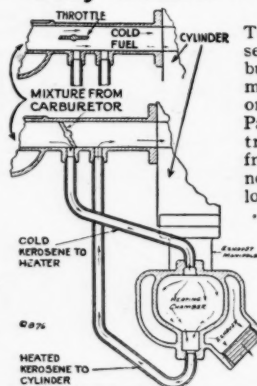
Charles City, Iowa

*A Light, Powerful  
Three-Plow Tractor  
of Simple, Sturdy  
Construction*



NAME	Rating	Fuel	Columbus, O., 1918	Sullivan, Kan., 1918	Marion, O., 1918	Columbus, O., 1919
Hart-Parr	30	Ker.	28.0	31.1	31.5	37.5
Rumely	14-28	Ker.				35.0
I. H. C.	15-30	Ker.				33.6
Russell	23-40	Ker.				33.4
Aultman-Taylor	15-30	Gas	25.0	26.0		31.8
Wallis	15-27	Ker.				27.6
Case	9-18	Gas				28.7
Moline	12-20	Ker.				25.5
Rumely	12-24	Ker.				24.9
Frick	12-24	Ker.				24.1
Hossian	12-20	Ker.				21.2
Titan	12-20	Ker.				24.7
Waterloo Boy	12-20	Ker.				20.8
Emerson	12-20	Ker.				19.8
Steel Mule	12-25	Ker.				28.3
Nilson	12-25	Ker.				21.4
Parrett	12-25	Ker.				19.7
Huber	11-22	Ker.				20.0
Lauson	13-20	Ker.				19.3
Fordson	13-20	Ker.				19.2
Mozul	12-25	Gas				18.0
Sid Jusk	12-20	Gas				18.7
Elgin	10-18	Ker.				18.0
Cleveland	9-18	Ker.				18.6
Case	12-24	Ker.				17.6
Shelby	12-24	Ker.				14.2
Bull	12-24	Ker.				17.6
Avery	8-16	Gas				16.0
Happy Farmer	12-24	Ker.				16.0
Whitney	9-18	Gas				17.6
Heider	8-16	Ker.				16.0
Avery	12-25	Ker.				16.0
Port Huron						14.4

### Dray Kerosene Shunt—



The Dray Kerosene Shunt, a carburetor attachment used only on New Hart-Parrs, enables the tractor to pass from full load to no load, from no load to full load without delicate adjustment of the carburetor and without throttling or misfiring.

### Specifications

**Power**—Pulls three plows—30 H. P. on belt.  
**Motor**—2-cylinder twin, 4 cycle. Valve in head, 750 R. P. M.  
**Tractor Frame**—Cast steel, one piece. No bend, no twist.  
**Carburetor**—New Dray kerosene shunt.  
**Bearings**—S. K. F. and Hyatt.  
**Speeds**—Two forward: one reverse.  
**Transmission**—Selective sliding gear.  
**Cooling Device**—Honeycomb radiator—shaft-driven pump and fan.  
**Lubrication**—Fresh oil, force feed.  
**Weight**—5,158 lbs.  
**Price**—\$1,395 f. o. b. factory.

# HART-PARR 30



## Regular Equipment On the NASH Car

The G & K Link "V" Fan Belt is regular equipment on the Nash Car. The Nash Motors Co. adopted it two years ago and as proof of satisfactory service, are still equipping their cars with the Link "V".

This fan belt is a combination of leather, fibre and steel links, so constructed that the steel and fibre links, carry the strain and the leather links only come in contact with the pulley to present the required friction surface.

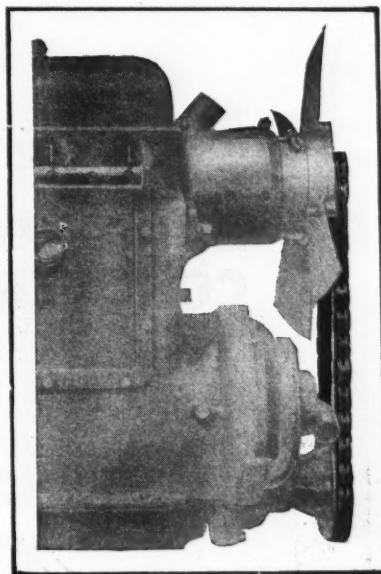
G & K Link "V" Belts have a positive grip but will not jam in the sheaves. They are designed to run slack on the drive, thus eliminating the possibility of journal friction even on very light bearings, and no matter how slack they are run they will continue to transmit power.

There's a Link "V" Fan Belt for each make of car. Let our Engineers give you the benefit of their fan belt experience.

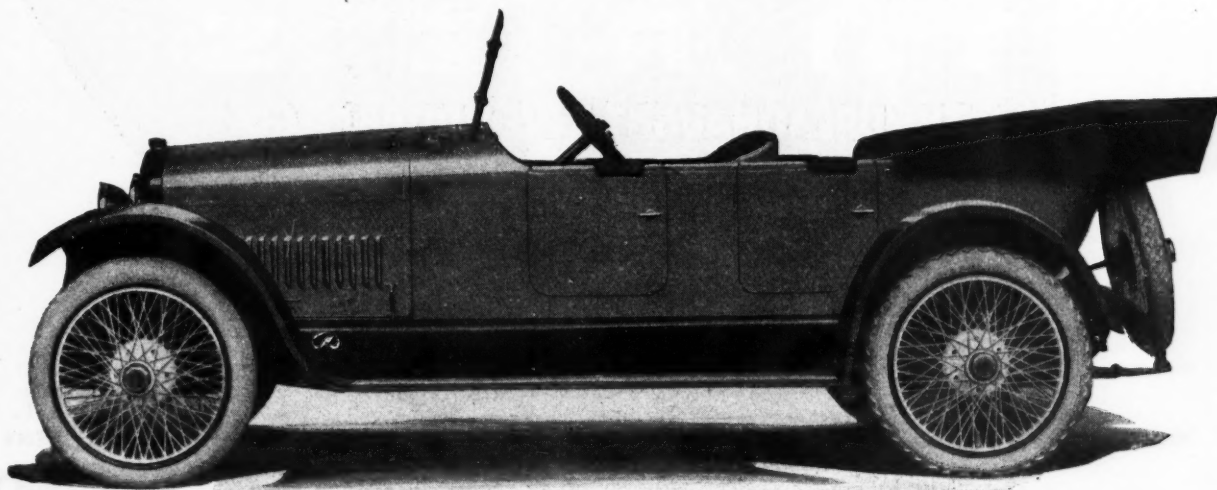
### The Graton & Knight Mfg. Co.

Automotive Equipment Division

Worcester, Mass.



*The G & K Link "V"  
Fan Belt—a combination  
of leather, fibre and steel  
links—on a Nash Motor.*





**BUILT TO  
CONQUER**

**DREADNAUGHT  
T I R E S**

THE DREADNAUGHT TIRE & RUBBER CO.  
BALTIMORE, MD.

**GUARANTEED 6000 MILES**

**CHARLES F. U. KELLY, Inc.**  
SALES DEPARTMENT  
**1834 BROADWAY**  
NEW YORK

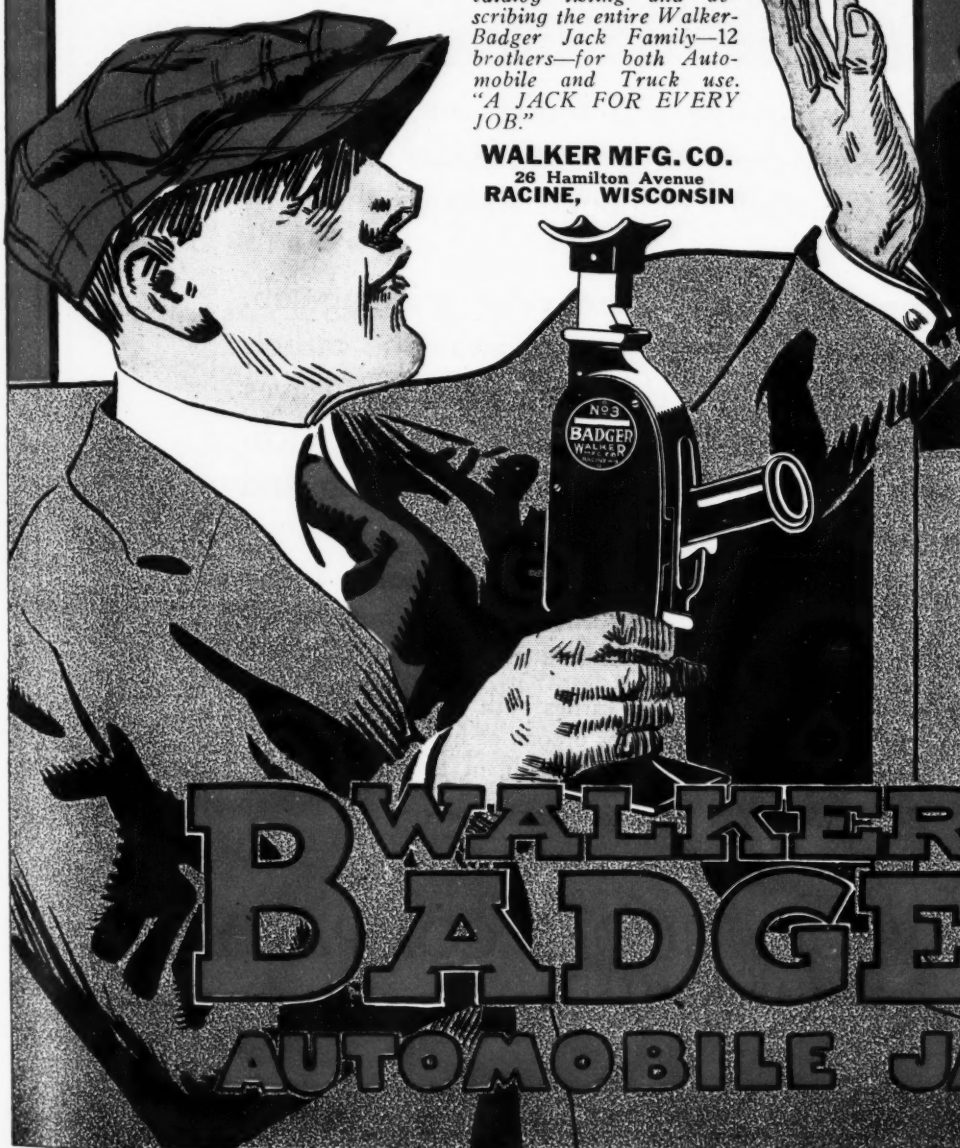
# "STAY IN DON'T NEED YOU HERE AND I'LL NEVER KNOW YOU'RE THERE"

"**Y**OU'RE pretty heavy, but a few hundred pounds extra weight don't bother a Walker-Badger Jack. Always greedy for work. Never needs any 'extra' help. Extremely easy to operate—anywhere—on inclines—slippery surfaces—in mud or sand. Simply slip it under axle—give handle a few easy pumps—up goes your car and the load it carries. When job's done—reverse lever—a few more easy pumps—and you're through. Always operates that way. I never expect Jack troubles—and never have any."

Walker-Badger Jacks are as convenient—as reliable—as free from trickery and trouble as the most scientific principles of construction, highest quality of materials and greatest manufacturing skill can make them—regardless of cost.

**DEALERS**—Send for catalog listing and describing the entire Walker-Badger Jack Family—12 brothers—for both Automobile and Truck use. "A JACK FOR EVERY JOB."

**WALKER MFG. CO.**  
26 Hamilton Avenue  
RACINE, WISCONSIN

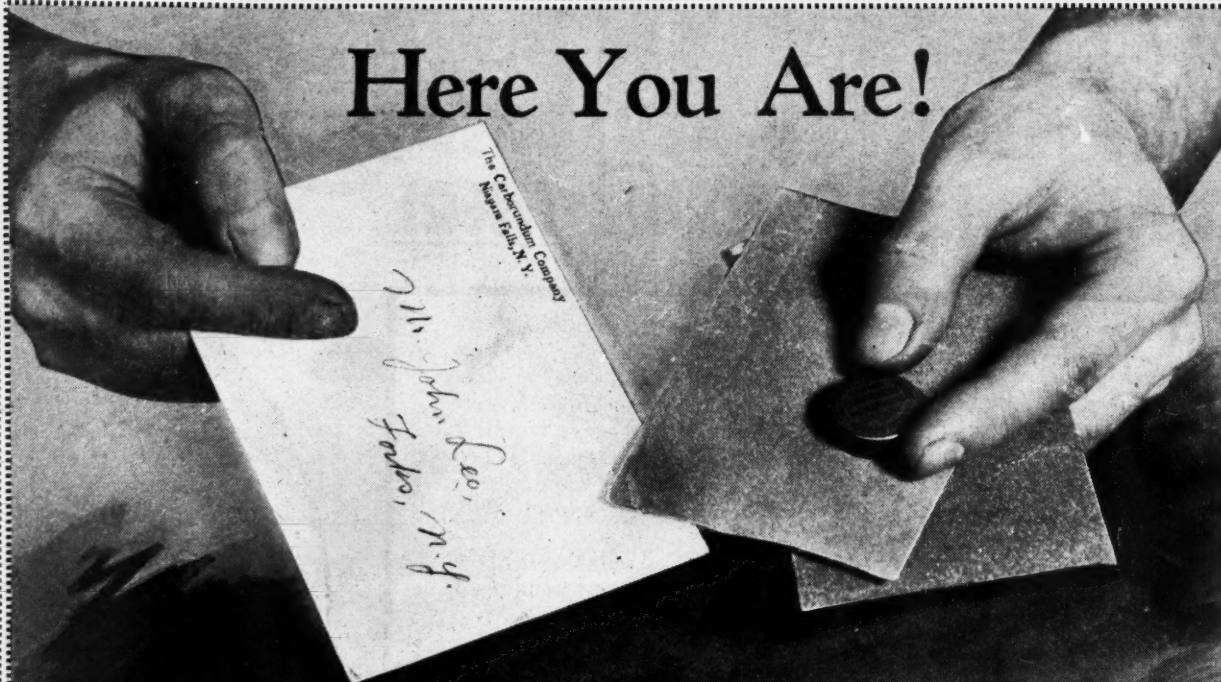


# WALKER BADGER

## AUTOMOBILE JACKS



# Here You Are!



JUST send us your name and address and back will come an envelope containing a sample can of Carborundum Valve Grinding Compound and two sheets of Aloxite Cloth.

Try the compound on your next valve grinding job. Note how quickly and easily it cuts away the carbon and pit marks. How true, clean and smooth it leaves the valve seat. It cuts remarkably fast without scratching or scoring. It will do your valve grinding and lapping quicker, better, easier.

Try the sample sheets of Aloxite Cloth on any shop work. It cuts clean and quick, leaving a smooth, uniform finish. It is wonderfully flexible and is uniformly coated with Aloxite grains.

Your accessory jobber or hardware man carries both these products—the compound in handy combination cans or one or five-pound tins—the Aloxite Cloth in rolls, sheets, or better still, in Economy Rolls.

*But Be Sure You Send for the Samples*

## THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI PITTSBURGH  
MILWAUKEE GRAND RAPIDS



## More Rubber in Mohawk Cords More Profit in Selling Them

Mohawk Cord Tires have a much thicker tread and contain considerably more rubber and stronger fabric than other Cords.

Verify this for yourself by comparing the weight of Mohawk Cords with others. You will find Mohawks weigh up to ten pounds heavier than competing makes.

Mohawk fabric tires are also heavier, due to their thicker treads and to the extra ply of fabric used in most sizes.

More rubber—pure rubber—durable fabric and an extra ply of it—surprisingly high mileage—uniform quality.

These are the definite, tangible advantages which Mohawk dealers offer their customers—advantages which appeal to the substantial worth-while buyers in their community—advantages which win and hold their business.

The most successful dealers recognize this is the only kind of business worth while.

Why not decide to build your business soundly on the quality basis? Such business is easy to get with the Mohawk line—and it will stay with you.

*Let Us Tell You More About Our Liberal Selling Proposition*

**MOHAWK RUBBER COMPANY, AKRON, OHIO**

Branches at: New York Boston Atlanta Chicago Kansas City Dallas San Francisco

# MOHAWK *"Quality"* TIRES

# Flexedge

SELF-SEATING  
LAMINATED VALVES

*Sensible-Logical-Inevitable*

A Valve-Seat Carbon Remover at Work While You Drive

## Just Test a Pair of FLEXEDGE VALVES

There never was any one piece of equipment that ever caused any greater interest in the automotive industry than FLEXEDGE VALVES.

Manufacturers, jobbers, dealers and car owners began testing FLEXEDGE VALVES immediately after we made our initial announcement.

## FLEXEDGE VALVES Prevent Carbon Deposits

As a result of these tests, we have received hundreds of unsolicited letters proclaiming FLEXEDGE VALVES as the real preventive of carbon deposits—the greatest cause of inefficient motor operation. Valve grinding is entirely eliminated, because FLEXEDGE VALVES are so constructed that the laminated edges of the valves are sufficiently flexible to continuously scrape the valve seat, thus preventing carbon from depositing. Just test a pair of FLEXEDGE VALVES!

## FLEXEDGE Prices

Ford .....	\$0.50 each	Oakland Six .....	\$1.25 each
Chevrolet .....	.75 each	Franklin Model B .....	2.00 each
Buick D44 .....	2.00 each	Saxon Six .....	1.25 each
Buick D45 .....	2.00 each	Elgin Six .....	1.25 each
Buick D55 .....	1.25 each	Grant Six .....	1.25 each

## FLEXEDGE Distributors

**Eastern Distributor**  
Federal Appliance Corp.,  
1966 Broadway,  
New York City

**Northern Distributor**  
Reinhard Bros., Inc.,  
Minneapolis, Minn.

**Western Distributor**  
Joseph D. Tripp,  
909 S. Grand Ave.,  
Los Angeles, Cal.

**Southern Distributor**  
"Kant Break" Spark  
Plug Co.,  
330 Madison Ave.,  
Memphis, Tenn.

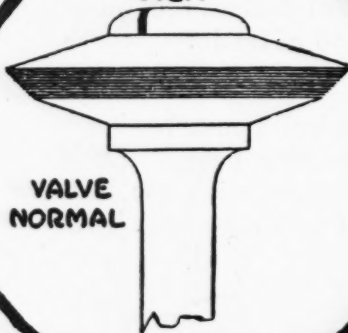
## SELF-SEATING VALVE CO.

706-8 Townsend St.

CHICAGO

ILLINOIS

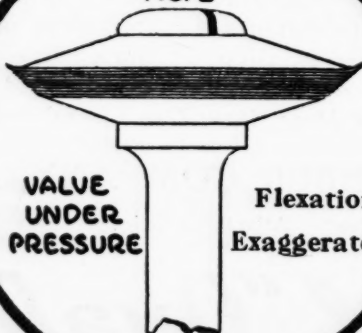
FIG. 1



VALVE  
NORMAL

Super Power

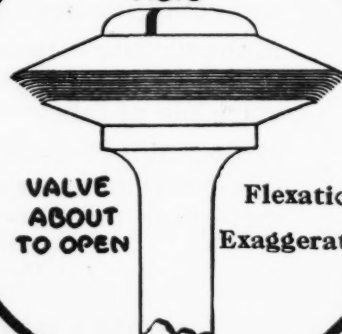
FIG. 2



VALVE  
UNDER  
PRESSURE

Flexation  
Exaggerated

FIG. 3



VALVE  
ABOUT  
TO OPEN

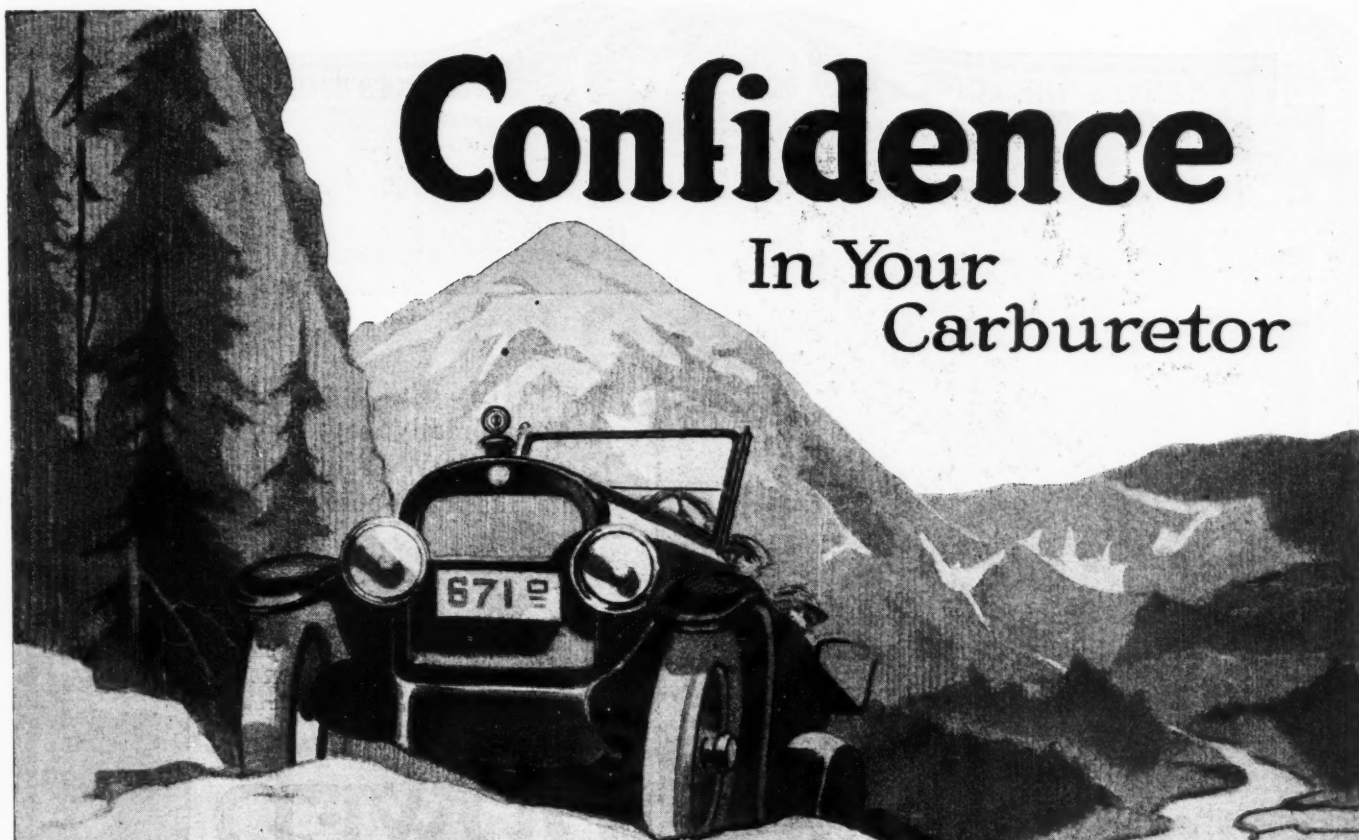
Flexation  
Exaggerated

No Valve Grinding



# Confidence

In Your  
Carburetor



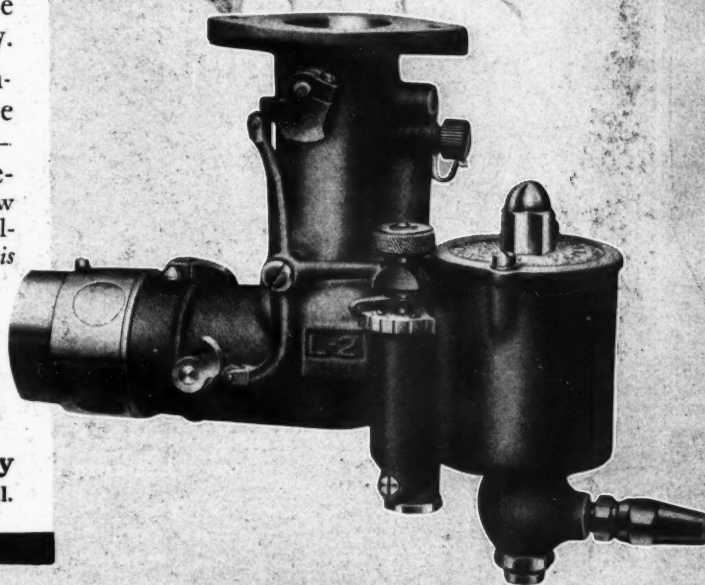
**T**HE more you associate with a new Stromberg Carburetor the firmer your confidence in its efficiency.

Your trust grows with contact with motoring trials. Anywhere—in any weather—rain or shine—blistering hot or freezing cold—boulevard or heavy mud—with any car the New Stromberg guarantees a quick start—then development of power that *gets* you there. And *this* at the greatest of mileage economy.

The utmost of engine energy at least of travel expense and trouble.

Write for descriptive matter. State name, year and model of your machine.

**Stromberg Motor Devices Company**  
Dept. 927, 64 East 25th Street - Chicago, Ill.



**New STROMBERG Does it!**  
CARBURETOR

CARRIES THE LOAD

TAKES THE THRUST

WHEN it comes to  
automotive wheel  
bearings BOWER demon-  
strate master superiority.



Make child's play  
ANYWHERE  
of load and thrust

**BOWER**  
ROLLER BEARING CO.  
Detroit Michigan

**Exclusive Bower Features**

Separate bearing surfaces for load and thrust. Parallel raceways. Self-aligning. Never need adjusting. Does not develop end thrust under loads. Will not bind or end-slip.







## These "MILES CHEAPER" Tires Will Cost You Less

Price and cost are two different things. You know the **price** when you pay your good money for a tire. You know the **cost** when the tire has run its last mile.

In fairness to yourself let QUAKER TIRES prove their low cost on your car. More than that, let QUAKERS show you comparative costs by matching one or more QUAKERS against the tires you are now using.

### QUAKER MULTI-TUBES

You will appreciate how good tubes can be made when you try QUAKER MULTI-TUBES.

Some day, perhaps, better tubes will be made, but at present you will search in vain for the equal of QUAKER MULTI-TUBES.



T. T. T.  
(Non-Skid)  
Reg. U. S.  
Pat. Off.

37 x 5

## QUAKER CITY RUBBER CO.

Manufacturers of Auto Tires and Inner Tubes  
Also Mechanical Rubber Goods

PHILADELPHIA  
629 Market St.

CHICAGO  
182 W. Lake St.

PITTSBURGH  
211 Wood St.

NEW YORK  
53 Murray St.





# HAWKEYE

## MOTOR TRUCKS

### What Is Its Reputation at Home?

If you want real information, find out what the users of a line of trucks think of them in the city where they are made.

Hundreds of Hawkeyes are in use in Sioux City and vicinity. If they were not making good, we could not hide the truth from this community.

One large firm in Sioux City wrote us:

"We have been using our 1½-ton Hawkeye Truck for over a year now and it is giving us very satisfactory service. For a truck of this capacity we do not think it can be equalled. We do not hesitate to recommend it to any prospective buyer."

Hawkeye Trucks are equipped with such Quality Tested Units as Buda Motor, Clark Internal Axle, and Fuller Transmission.

In addition, we make over 170 parts in our own factory.

### HAWKEYE TRUCK CO.

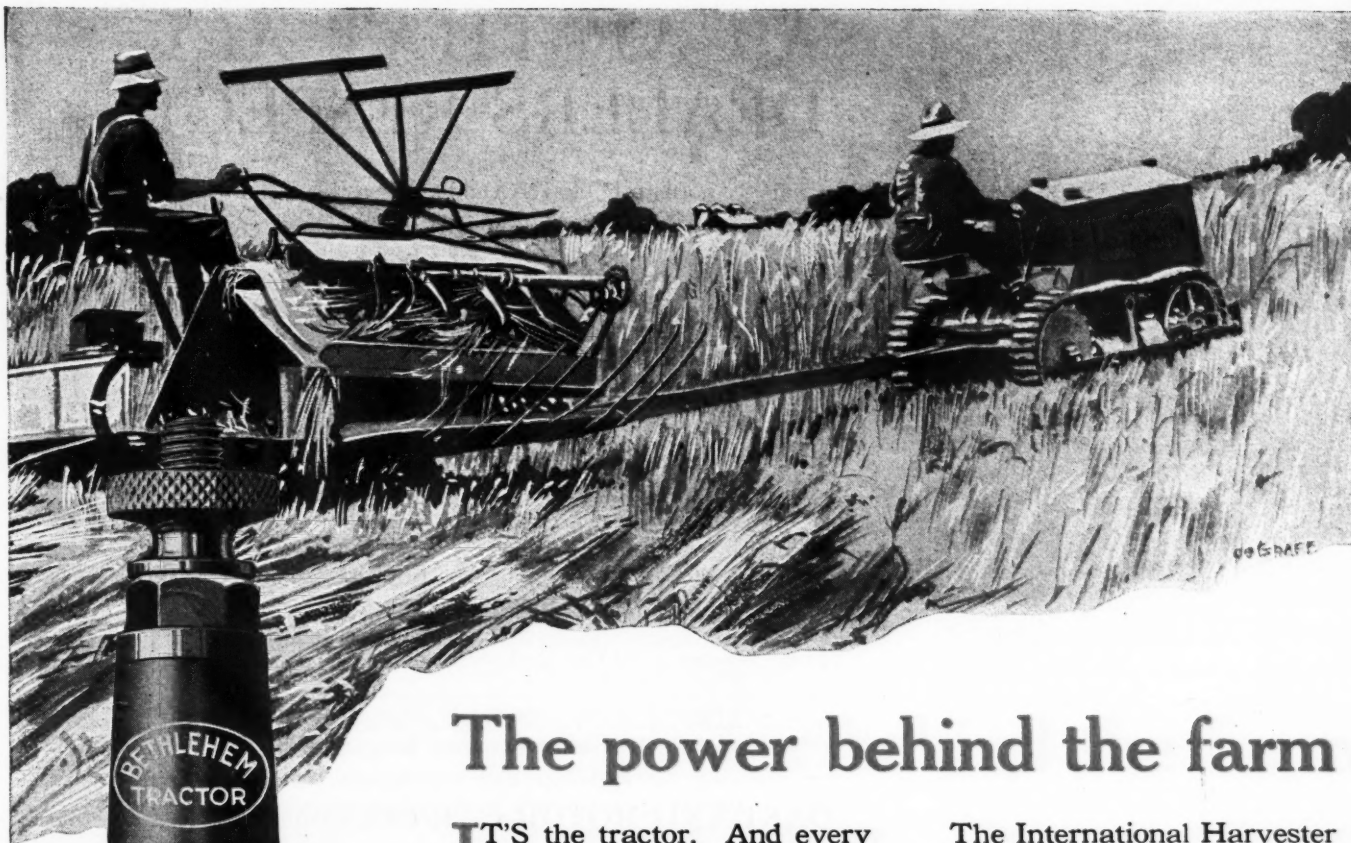
*Manufacturers of Good Trucks Sold at a Fair Price*

R. A. BENNETT, President

616 Sixth Street

Sioux City, Iowa





## The power behind the farm

**I**T'S the tractor. And every time you sell the tractor owner an automobile spark plug to put in his tractor motor you are going a long way toward hindering this modern "power behind the farm".

Bethlehem Tractor Spark Plugs are built specially for tractor use.

They are built with the assistance and experience of tractor engineers.

They are built to stand the *unusual* strains that an automobile plug would yield to.

*In spite of a far higher selling price, they are the largest selling tractor plugs on the market—the most striking evidence of their quality.*

The International Harvester Company uses them for standard equipment.

So do other prominent tractor manufacturers.

Price is no argument, because performance—*real performance*—is built into every plug.

Stock the Bethlehem line of tractor plugs. Do your part to keep the "power behind the farm" alive and going—and build a growing profitable business among tractor owners in your territory.

The Silvex Company  
**BETHLEHEM PRODUCTS**

E. H. SCHWAB, President  
Bethlehem, Penna., U. S. A.

¾ inch long mica tractor plug. Used as standard equipment on International Harvester Tractor and others.

*Bethlehem* **SPARK PLUGS**

## A CAR THAT ALL DEALERS RESPECT

Probably no man holds the Oakland Sensible Six in higher esteem than the man who sells it.

Through his intimate association with so many Oakland cars, and with so many Oakland owners, he has learned that the goodness of the Oakland is uniform.

He knows that the ability and economy of one Oakland is common to another, and that under the most varied conditions of service, all Oaklands perform with unfailing reliability and effect real and constant savings.

And he finds that it is both profitable and satisfying to handle a car so deserving of his respect, especially when that car has the respect of the public as well.

There is some good Oakland territory open.

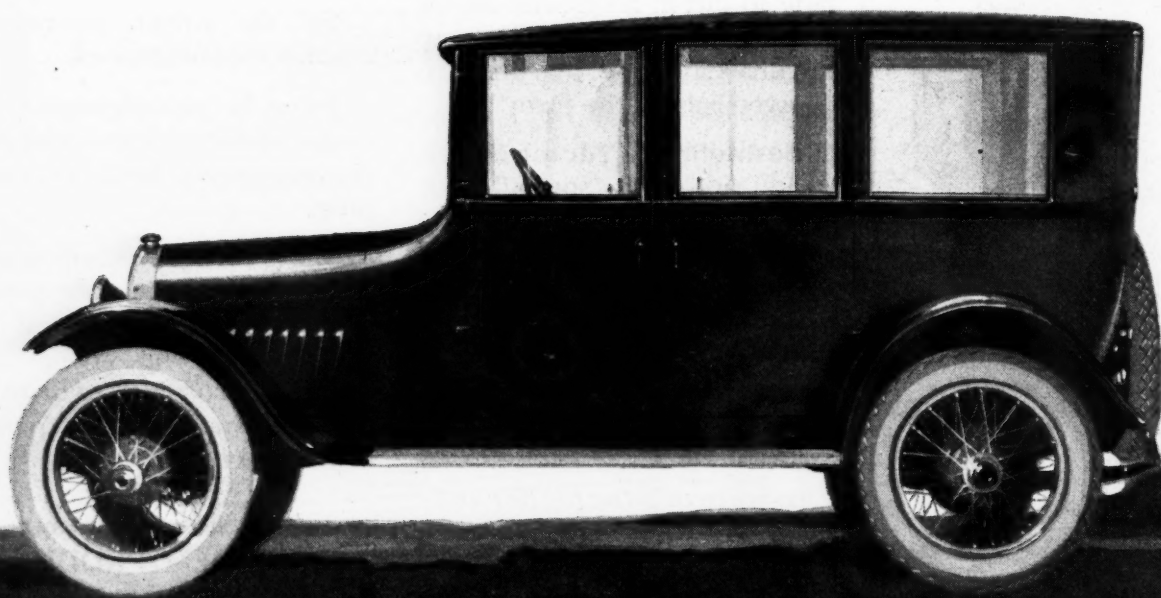
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*Oakland owners regularly report returns of from 18 to 25 miles from the gallon of gasoline, and from 8,000 to 12,000 miles on tires.*

---

### OAKLAND MOTOR CAR CO., Pontiac, Mich.

Touring Car, \$1075; Roadster, \$1075; Coupé, \$1650; Four Door Sedan, \$1740  
F. O. B. Pontiac, Mich. Additional for Wire Wheel Equipment, \$75



# OAKLAND

## SENSIBLE SIX



## Performance vs. ?

In selecting a Compressor, what interests you most? Prices? No! Promises? No! Technical details? No! In the end, it is the cost of giving air service. You must have confidence in the concern that sells the outfit, confidence in the manufacture, and confidence in the future performance of the outfit.

Brunner Air Compressors have come to the front in the minds of the progressive garage men of the country. Brunner equipment has won and is holding national leadership as the undisputed standard.

No sales argument, no frenzy of advertising, no freak fixtures could win and hold that dominance. Brunner equipment has construction care that spells Performance. And, Performance merits leadership.

Brunner engineers use the laws of pneumatics---they know the intricacies, complex problems and possibilities---after years of study and putting these laws into practice their resultant products give consistent economical Performance.

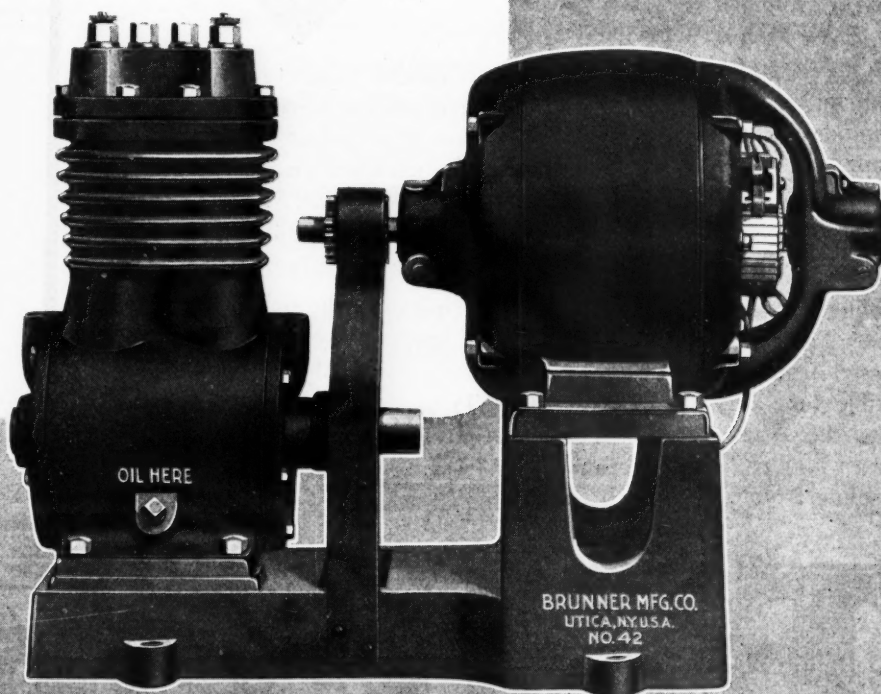
Write for illustrated folder,  
displaying all types  
and sizes.

### BRUNNER MFG. CO.

Works  
UTICA, NEW YORK

Sales Offices  
UTICA, N. Y.  
CINCINNATI, O.

# BRUNNER



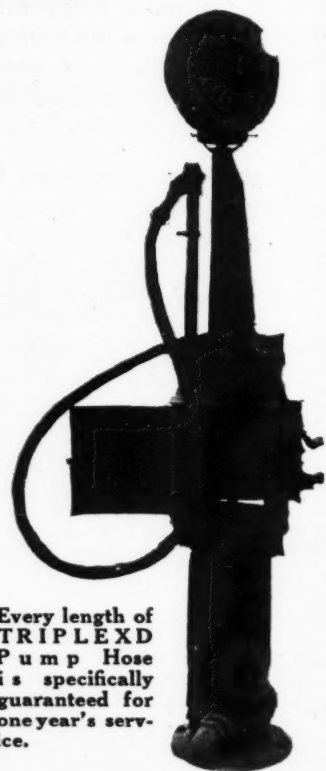
## Why TRIPLEXED HOSE Is Standard Equipment On Rapidayton Pumps

Features that prove the superiority of Cut No. 25 Rapidayton Curb Pump



### 4 Years Service Without a Leak

This Rapidayton Pump belongs to Mr. A. C. Simmons, owner of the Gulf Service Station at Ave. O and Ocean Ave., Brooklyn, N. Y. The length of Triplexd with which it is equipped has been in use for 4 years. It has never leaked a drop or given any trouble and is still in good condition.



Every length of TRIPLEXD Pump Hose is specifically guaranteed for one year's service.

The remarkable results shown by Triplexd Gasoline Hose have led the DAYTON PUMP AND MFG. CO. and nearly all other pump makers to adopt Triplexd as standard equipment for their pumps.

Triplexd performance depends on Triplexd construction.

The metal lining insures clean gasoline, free from rubber sediment. The compact rubber layer pressed around the flexible tube prevents the evaporation of gasoline from

the joints. The tough fabric jacket, woven over the rubber before it is vulcanized, grips it with a pressure of 330 lbs., preventing separation of the layers. The fabric takes all strains and wears like iron.

Triplexd is the only hose that will successfully resist the deteriorating effects of gasoline and Oil. It pays to specify Triplexd.

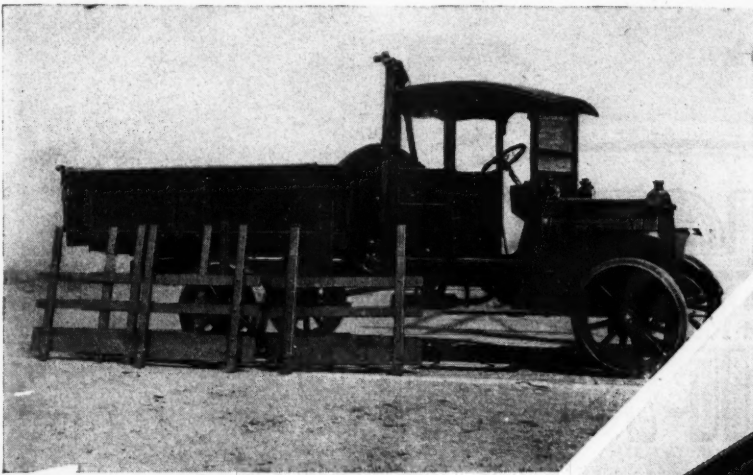
**METAL HOSE & TUBING CO.**  
INCORPORATED  
235 Tillary St.  
BROOKLYN, N. Y.

# TRIPLEXD

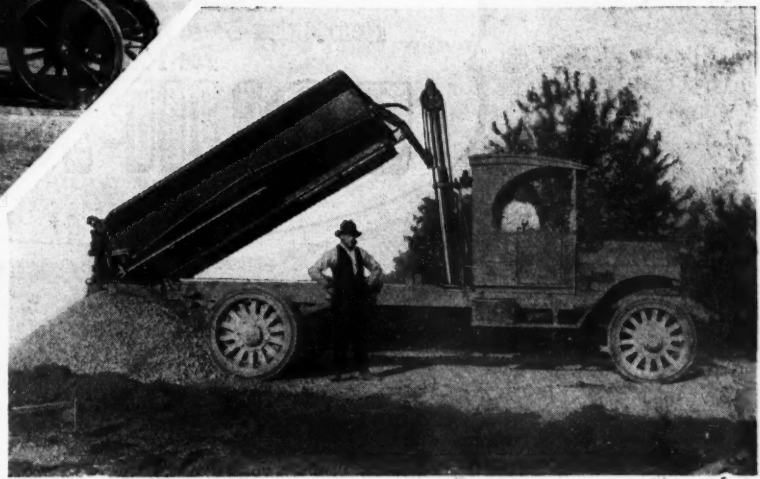
XXX GASOLINE HOSE XXX

TRADE MARK REG U.S. PAT. OFF.

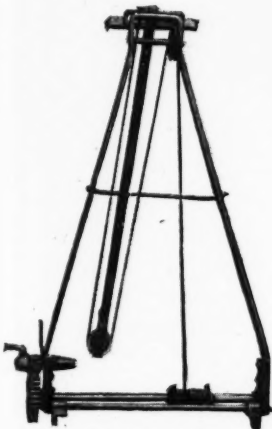
# DAILEY MOTOR TRUCK BODIES



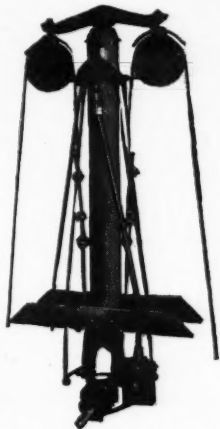
Dailey 4-in-1 Body, with hand hoist. Can be changed from one type to another in 3 minutes without tools.



Standardized special steel bodies—any style—any design—built for long life and severe service. Delivered promptly.



Dailey Hand Hoist, sturdy and efficient. Occupies but 9 inches of space on chassis. For trucks of all capacities.



Hydraulic Hoists—for use with steel bodies and for heavy duty work.

## Steel and Wood Body Distributors

Auto Hoist & Body Company, 18 Bainbridge Street, Brooklyn, N. Y.

Simplex Body Co., 140 Rhode Island Street, Buffalo, N. Y.

The Truck Engineering Co., 3533 Cedar Avenue, Cleveland, Ohio.

Simplex Mfg. Co., Conneautville, Pa.

The John Immel & Sons Co., Columbus, Ohio.

Hydraulic Hoist Mfg. Co., 715 Lorraine Avenue, Detroit, Mich.

Auto Hoist & Body Co., 333 Avenue B, New York City, N. Y.

Troy Trailer Co., 5 North 21st Street, Philadelphia, Pa.

Thomas & Company, Braddock Avenue, near Forbes Street, Pittsburgh, Pa.

Auto Truck Steel & Wood Body Co., Frisco Building, St. Louis, Mo.

## Make Dailey Bodies Help Sell Your Trucks

Progressive dealers are building bigger business by selling trucks with equipment selected to fit each buyer's needs.

Since the body carries the pay load, it requires greatest consideration. It is the one made-to-order part of a truck and should be given the attention of a specialist.

Dailey engineers are haulage experts—they know the type body that will give your customer most service—

And service sells trucks nowadays. Learn more about how Dailey Bodies help sell trucks.

*Write TODAY for booklets and dealer plan.*

**H. R. DAILEY, Auto Truck Steel Body Co.**  
3028 Carroll Ave. Chicago





Clark Internal Gear Axles  
and Clark Disc Steel Wheels  
are found only on good  
motor trucks.

CLARK EQUIPMENT COMPANY  
BUCHANAN ————— MICHIGAN

## THE ONLY SCREW HOLES IN THE WORLD



You drive the screw holes with a hammer in any material.

The screw holes are made for wood screws or machine screws to fit all sizes of screws. The head is removed and you leave a permanent screw hole.

### The Stine Screw Holes Co.

Manufacturers

WATERBURY, CONN., U. S. A.

DEPARTMENT

5

*The Biggest  
Little Thing  
in the World*

*Once a Screw  
Hole, Always  
a Screw Hole*

#### Some of the Reasons Why Screw Holes Will Be Bought and Used and Not Become Dead Stock for Anyone

- 1—They can be used without damage to receiving material.
- 2—They enable you to standardize to wood or machine screws in all material.
- 3—They are made of brass and will not rust under atmospheric or moisture conditions.
- 4—ECONOMY—They save more time value than the holes cost.
- 5—You get them for nothing and are paid for using them when you count time saved.
- 6—Screw holes have been needed ever since the first screw was used.
- 7—Special tools are NOT needed in using them in any material.
- 8—They can be used in any place a screw can be used.
- 9—By using screw holes, screws can be used in many places, and in many materials where it is impossible to use screws without them.
- 10—These are the only ready-made screw holes in the world.
- 11—No special screws are needed. These screw holes fit any wood screw or machine screw now in stock.
- 12—They make the neatest possible job in any material.
- 13—Every store where screws are sold must carry them in stock, because the line of screws is not complete without screw holes for them.
- 14—Every shop and factory where screws are used must also have these screw holes to fit the screws.
- 15—They are endorsed by all dealers in screws and by all users of screws.
- 16—Screw holes are entirely new and the world supply is yet to be furnished.
- 17—This is a progressive Old World of ours, and every active person in it must adopt all improved methods, and all new articles that will help him keep in the front line of progress.
- 18—Be among the first to stock up in screw holes if you are a dealer in screws.
- 19—Be among the first to install screw holes in your shop or factory, as you begin to save money soon as you use them.
- 20—In spite of the high cost of brass, screw holes are yet cheap.
- 21—We are letting the world know that screw holes can now be secured, by means of extensive advertising in all the principal Trade Journals that have the largest circulation among dealers in screws as well as users of screws.
- 22—Do not let your customer ask you for screw holes before you have them in stock. BE A LIVE WIRE.
- 23—They make everlasting holes in any material.
- 24—They mean "Plug-No-More" screw holes.
- 25—They are the result of Necessity being The Mother of Invention.
- 26—Anyone who can drive a nail can use screw holes.
- 27—Send for a sample and convince yourself.
- 28—Mechanics who see them say, "What do you think of that?"
- 29—In fact there are NO REASONS why screw holes should NOT be used.

Each of these reasons are enough to sell Screw Holes. There are many other reasons.

Write at once for our handsome **Color Card** showing screw holes in various materials which will be sent on request, together with samples and price list.



# HIGGINS QUALITY

## SPRINGS

*for all*  
PASSENGER CARS AND TRUCKS

### Lengthening the Life— Lowering the Cost of Your Springs

The quality of wear is the primary quality value of a Spring for automotive use. Whether you build Trucks or Passenger Cars—whether you distribute Replacement Springs or sell them direct to the user, you want a spring that will wear—a spring that will stand up and take the crushing smash of massive trucks—that will hold together under the jump and sway of a lightweight car.

In this particular quality, as in all others, Higgins Springs rank supreme. The type of construction—no center hole, bolt, or hump—the toughness of metal acquired through our exclusive method of heat treatment—produce a spring that is virtually breakage-proof, not only in the center but in every section.

**Manufacturers of passenger cars and trucks** will find it to their best interest to submit specifications of requirements.

**Jobbers and dealers** should have a copy of our comprehensive Replacement Spring catalog—a spring for every make of automotive vehicle.

**HIGGINS SPRING & AXLE CO.**  
Dept. 921  
Racine - Wisconsin





## A Battery with the Power of an Electric Furnace

Demonstrate the infallible starting strength of this storage battery on the floor of your garage by means of the spectacular "Spike" Test.

Two pliers and two 20-penny nails are the only equipment needed. Hold a spike to each battery terminal by means of the pliers. Short circuit the battery by touching the ends of the spikes. **MAC-LAR MELTS THE SPIKES.**

Think what this high electrical discharge rate will mean to a stiff motor on a cold morning!

An 18-month written guarantee insures permanence of this power

Three special advantages are combined exclusively in Mac-Lar. (1) Extremely hard plates insure long life. (2) There is 25% extra capacity for the same plate area, and a higher momentary discharge rate than any soft plate battery. (3) Recharging efficiency is unusually high.

**STANDARDIZATION IS THE KEY NOTE OF THE  
GREATEST BATTERY SALES PROPOSITION IN THE WORLD**

*Mac-Lar Batteries Fit 99 cars out of a hundred, replace more than 51 combinations of other batteries.*

Four standard models are furnished, made in 6 and 12-volt.\*

Our universal terminals make the installation of Mac-Lar Master Batteries a simple job—a blow torch is the only tool necessary.

\*A small battery starts the stiffest engine because of its high discharge capacity.

6-volt—\$25.00; 12-volt—\$36.00. Price made possible only by standardization.

Hundreds of dealers have already proved to their own satisfaction that the Mac-Lar Battery is an ideal selling proposition.

*Territories for the right kind of men are open everywhere.  
Write or wire for the Mac-Lar money-making proposition.*

**MAC-LAR BATTERY COMPANY, INCORPORATED,**

**Detroit, U. S. A.**

# MAC-LAR

## MASTER STORAGE BATTERY



Mr. Homer Hilton, Sales Manager,  
Oshkosh Motor Truck Mfg. Co.,  
Oshkosh, Wis.

Dear Sir:

We are glad to tell you of the satisfaction you in April. We have been using this truck hauling hemp stalks from the farmers' fields to our mill, which is probably as severe a test as a truck was ever called upon to perform, but our records show that during May and June we were able to haul 8 to 10 tons of hemp daily a distance of 10 miles and return, at a cost of about \$2.00 per ton. Formerly with a team this required all day for a round trip with two tons. As you know, the roads around Brandon are probably the worst in the world, and no other truck to our knowledge has ever been able to operate consistently over them in all kinds of weather. It is probable next year we will require two or three more trucks, and you may rely on it, they will be Oshkosh four-wheel drive.

Yours very truly,  
WISCONSIN HEMP CO.  
*R. J. Hilton*  
Pres.

One day in early spring—  
snow still on the ground—  
this truck, owned by the  
Wisconsin Hemp Co.,  
Brandon, Wis., hauled out  
unassisted twelve stalled  
trucks of various makes  
on a 32-mile strip of road.

Then you'll be interested in having us prove to you that with the OSHKOSH this is no isolated case.

5½ tons is the usual load for this truck with trailer. It makes long and short hauls (mostly long) in good and bad weather, over good and bad roads (mostly bad) and keeps right on going over places where trucks of higher rating are stalled.

The truck for the user to standardize on—  
The truck for the dealer to build business on.

Here's What One  
User Says of the

## OSHKOSH 4-Wheel-Drive Truck

(Two-Ton Capacity)

Doesn't it make you wish that as much  
could be said about the year-around  
performance of *your* trucks?

The Oshkosh 4-Wheel-Drive attains practically 100% transmission of motor power to the four wheels, all of which are driving wheels—front ones pulling and rear ones pushing. In this truck there is virtually no power loss due to road slippage, whereas, with the two-wheel drive the average loss on good roads is 20%. We can lay before you plenty of proof that the OSHKOSH 4-WHEEL-DRIVE hauls a capacity load at greater speed, on less gas, than other two-ton trucks.

# OSHKOSH MOTOR TRUCK MFG. CO. OSHKOSH, WIS.

# UNITED SPARK PLUGS

## *Big Sellers— and Hard Workers*



*Made for a Purpose  
—Consistent Ignition*



United Spark Plugs are big sellers—repeat sellers because they are hard workers.

The United Spark Plug looks husky—it is husky. It is strongly made to survive the punishment of hard work.

Firing a fat, explosive spark into the heart of the mixture,—all of the time—is the steady duty of United Spark Plugs.

The United “Lockt” Terminal with its tenacious grip gives a firm, lasting contact that never loosens.

You don't have to make excuses for United Spark Plugs—they stay sold.

United Spark Plugs live long and work hard.

---

*Ask your Jobber for the Plug in the Yellow Checkerboard Box*

---

### RETAIL PRICE

Heavy Duty	Junior Type
(for trucks and tractors)	(for Passenger Cars)
\$1.00	75c

Look in the Chilton Automobile Directory and Auto Trade Directory for List of Jobbers handling United Spark Plugs

UNITED MANUFACTURING & DISTRIBUTING CO.

LAKE SHORE DRIVE AND OHIO STREET

CHICAGO, ILLINOIS

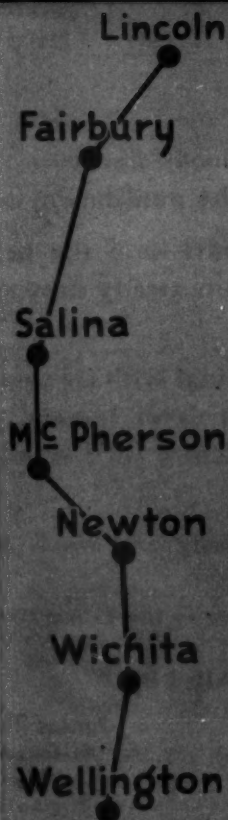
New York Representatives  
GRAY-ANDREWS CORPORATION  
73 Warren St., New York

Pacific Coast Representative  
A. C. RIDDELL  
Marvin Bldg., San Francisco, Cal.  
Higgins Bldg., Los Angeles, Cal.



## 350 Miles to Wellington

*Five automobiles stuck here—near Fairbury—the day Patriot Trucks came through on high. It's gumbo. Most of the distance was through such roads; much of it, in addition, through a driving rainstorm.*



## 350 Miles of Proof That Patriot Trucks Are Master of Every Road and Every Load

During June three Patriot Trucks—one 2½ Ton and two 1½ Ton—loaded with binder engines for the harvest fields of Southern Kansas, left the Patriot factory at Lincoln, Nebraska, for a run to Wellington, Kansas, a distance of 350 miles.

The route lay through Fairbury, Nebraska; Salina, McPherson, Newton and Wichita, Kansas. Over most of this territory there had been much rain for several weeks, and some of the roads had practically no bottom. In fact, the drivers purposely picked the very muddiest roads of the season, as the Wellington distributors, to whom the trucks were sold, wanted to know just what they could expect of Patriot Trucks on country roads at their worst.

Over 200 miles of the trip was made in the rain, the trucks sinking hub deep in many of the roads, but the entire trip of 350 miles was made in two days, each truck going through on its own power, without having to be pulled out of the mud a single time.

We receive similar reports from all over the country where Patriot Trucks are in use, and our distribution has been built up so rapidly because of such unusual performance. Write what territory you would like.

### HEBB MOTORS CO.

Manufacturers

1391 P Street

Lincoln, Nebraska



# PATRIOT



# MILEAGE

What are you  
paying for  
MILEAGE?

Quality, and Quality  
Alone, Counts in a Real  
Mileage Guaranteed Tire

The Perfection plant, which will ultimately turn out 11800 tires daily, is now under the control of the Nemours Trading Corporation. This organization is throwing its heavy weight of responsibility into the production and sales.

Perfection Asbestos Protected Tires are sold under a positive adjustment of 8000 miles on all non-skid. This is but a safeguard for the buyer accustomed to measure by a figure and not by performance.

Perfection Asbestos Protected Tires have everything that other high-grade tires have in their construction. Their additional features are an extra ply of fabric, and the protection of an open weave ASBESTOS BREAKER STRIP.

The Asbestos Breaker Strip practically eliminates blisters and tread separation. In the process of curing it becomes almost inseparable from the rubber.

Besides the exclusive Asbestos Breaker Strip feature, an extra ply of the strongest Sea Island Cotton Fabric gives the tire added strength. Every ounce of material entering into the construction of PERFECTION TIRES, from the tread rubber down to the bead stock, is of the best quality the market affords.

## Perfection "Rib Skid" Tires

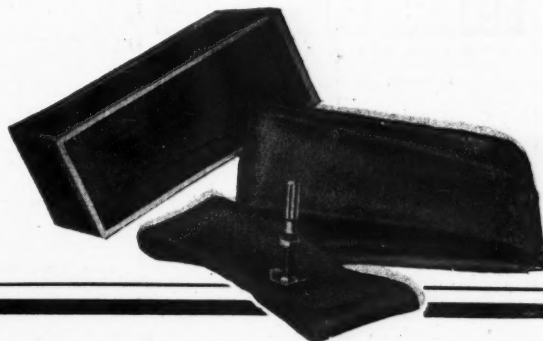
Made in Regular and Millimeter Sizes. 6000 mile adjustment. A quality line of fabric tires built by our own experts that made Perfection Asbestos Tires Famous.

The Nemours Trading Corporation has control of production and sales. Write to us for our sales plan. It gives you profits and the support of an institution of national prestige behind a tire that talks for itself.

### The Nemours Trading Corporation

General Sales Department for Perfection Tire and Rubber Co.  
151 Fifth Avenue New York

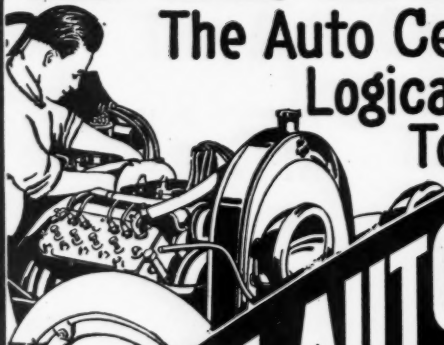
Guaranteed  
for 8000  
Miles





# DETROIT

The Auto Center is the  
Logical Place  
To



Training for  
Head and  
Hand

## LEARN AUTO AND TRACTOR BUSINESS

**THOUSANDS OF Ambitious Men Wanted**  
in the Auto, Truck and Tractor Business. An army of competent men is needed—and in demand—to keep the more than six million machines in good running order. It means a wonderful opportunity for live hustlers to earn big salaries or start in business for themselves. Every community needs trained, competent men for this work—men who know and can be depended on to do a job thoroughly and correctly.

### You Can Qualify For This Opportunity

A few weeks' study at the Michigan State Auto School will fit you to fill any of these positions or even open a garage of your own. Every phase of auto, truck and tractor work is thoroughly taught. Nothing is left out. You learn everything right from the beginning. When you have finished our course no job will be too hard for you. Our graduates easily

### Earn \$100.00 to \$400.00 Monthly

Read what guarantee says on that point. You don't run any risk. If you do your part the result is sure. The big factories all know our reputation for thoroughness and are constantly calling on us for men. The demand for men who know the auto, truck and tractor business is far greater than the supply. Big salaries are gladly paid to those who make themselves thoroughly competent.

### Big Demand For Detroit Trained Men

There's a big advantage in coming to Detroit. It is the Automobile Center—the Heart of the Industry—the logical place to learn this business. You get the benefit of close co-operation with the biggest factories. Many of the biggest men in the auto and tractor business give our graduates actual and valuable assistance in garages, service stations and as traveling service men.

Follow the crowd to the Michigan State Auto School, Detroit, Mich.



Read what the manufacturers say  
about the M. S. A. S.



### MAXWELL MOTOR COMPANY

REPUTATION FOR AUTOMOBILES

DETROIT, MICH.

Mr. James Williams, 20 Lincoln St., Gloversville, N. Y.

Dear Sir:—Your letter of February 23rd, making inquiry regarding the Michigan State Auto School received.

Wish to say that this is one of the best schools in the country, and would not hesitate to recommend it to anyone who is desirous of learning the automobile business. It is a recognized institution among the automobile factories of this city.

We have a great many graduates from this school in our employ and every one has given entire satisfaction. Trusting this information will be of benefit to you, we remain,

Very truly yours,

MAXWELL MOTOR COMPANY, Inc.

CHALMERS PLANT.

H. H. Lee, Supervisor Welfare and Labor



DETROIT, MICH., U.S.A.

The Michigan State Auto School enjoys a very enviable reputation and is probably one of the best of its kind in the United States. I have no hesitation in recommending it in every particular. Yours very truly,  
PACKARD MOTOR CAR COMPANY.

This is a picture of one of our March, 1919, classes

### Equipment Best Obtainable— Course Interesting and Complete

In our garage repair shop alone we constantly have from 20 to 35 cars to work on. Every known make of car comes to us for repair. That gives you the widest possible experience in actual garage work. Our block test department has 25 different types of motors with which you are made familiar. Other equipment includes chassis of various standard cars. Every essential feature is covered—nothing omitted. Instructions are complete and cover autos, trucks and tractor business.

### Brazing, Welding and Tire Repairing Taught

Complete separate courses given on these subjects. Brazers and welders get \$5.00 to \$10.00 per day. Factories and garages always need competent men. Also big opportunities repairing tires—six million in use.

### Big Factories Endorse Our School

They have assisted in outlining courses. Valuable lectures on theory and practice voluntarily included. Our school, equipment and methods highly commended by biggest factories. The thoroughness of our course has earned their best co-operation. Our reputation for excellence is world wide.

### Start Any Time—Earn While You Learn

School open all year. Enter classes any time. Three classes daily: morning, afternoon, evening. Instructors are members of the Society of Automotive Engineers (S. A. E.) Our graduates get jobs easily. If necessary we can secure work for you to help pay expenses while taking the Course.

### Free—New 176-Page Catalog

Tells complete story—answers all questions—shows 133 pictures of unexcelled equipment—quotes hundreds of letters from satisfied graduates—dozens of letters from factories recommending our school and methods; 7,000 successful graduates all over the world prove that it pays to come to the Michigan Auto School. Detroit—the Auto Center—and "learn the business right." Dozens never stop to write—they come to investigate personally, prepared to start at once, and not one has been disappointed. One young man came 3,000 miles; became an enthusiastic student; induced others to come and since graduating has made a big success in the work. You can do the same if you mean business. But don't delay. Our guarantee protects you. Jump right on the train and come at once. Send coupon telling when to expect you. If you can't come, ask for catalog—TODAY.

### Michigan State Auto School

Most Progressive Auto School in America

7609 Auto Bldg., 687-89-91 Woodward Ave., Detroit, Mich., U. S. A.

### KING MOTOR CAR COMPANY

DETROIT, MICH.

DETROIT, U.S.A.

Replying to a recent letter addressed to Mr. Artemas Ward making inquiry as to the reputation of the Michigan State Auto School, will say that as far as we know all Detroit Automobile manufacturers endorse the work they are doing. It is managed very efficiently and they have been turning out some pretty good men for the automobile industry and cannot see any reason why you should hesitate about taking a course with this institution.

Yours very truly,  
KING MOTOR CAR COMPANY.



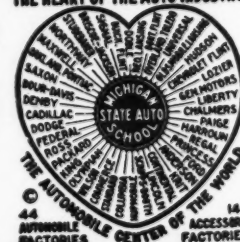
### NOT A ONE MAN SCHOOL

This school is founded on the best, most practical and newest principles in the Automobile, Truck, Aero-plane and Tractor business. It is the result of the keenest co-operation with manufacturers, service stations, garages and owners. It is not one man's idea, but the ideas of the biggest, best, and most successful men in each field.  
A. G. Zeller, President

### MONEY-BACK GUARANTEE

We guarantee to qualify you for a position as chauffeur, repair man, tester, demonstrator, auto electrician, garage man, automobile dealer or tractor mechanic and operator paying from \$100 to \$400 monthly or refund your money.

### DETROIT THE HEART OF THE AUTO INDUSTRY



### SEND THIS COUPON TODAY

MICHIGAN STATE AUTO SCHOOL  
7609 Auto Bldg., 687-89-91 Woodward  
Detroit, Michigan, U. S. A.

Gentlemen: Please send me, absolutely FREE new 176-page Illustrated Catalog, "Auto School News," and information as checked below.

- ☐ Auto and Tractor Course
- ☐ Tire Repairing
- ☐ Brazing and Welding

(Mark each course you are interested in.)  
Or, better still, you can expect me about

Name .....  
Street .....  
City ..... State .....



# CONNECTICUT



## CONNECTICUT "QD" TERMINAL

*Standard Equipment on the Liberty Motor*

Here is the simplest and most satisfactory spark plug connection ever devised. While it is easily attached and detached, connection is positive and cannot jar loose.

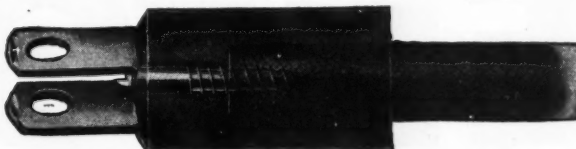
The terminal is furnished with a highly insulated collar, making it safe to handle—without risk of shock.

The wire connection is made without soldering, as the screw, in imbedding itself in the strands of the cable, expands and makes the tightest kind of fit with the collar. The ears in turn fit over a hexagon ball nut which screws on the spark plug, as shown in the illustration.

No other terminal gives half the satisfaction in service or half the convenience for inspection as this one does.

Its adoption by the United States Government as standard equipment on the Liberty Motor is a most convincing endorsement of its practicability.

**CONNECTICUT TELEPHONE & ELECTRIC COMPANY**  
62 BRITANNIA ST. MERIDEN, CONN.



Collars are furnished for 3-8 in., 7mm., or 5-16 in., 9mm. and the ball nuts are tapped for any thread.

## GOLDEN GIANTS and SALES DEMOCRACY

Give your customer the privilege of self-determination. A forced sale is seldom satisfactory. Its after effect too often repels further buying.

When a customer is privileged to make a choice of spark plugs, he appreciates that your only interest is to give him what he wants.

Include Golden Giants with what you show him. Watch which way the straws of self-determination blow. We have no fear of the result of such a test. It has been tried already by 40,000 accessory dealers and garages and in almost every case the Golden Giant has won out.

There are many reasons why Golden Giants meet and beat competition.

- 1—Because they are only \$1.
- 2—Because the pure gold finish makes the Golden Giant look like more than the price you ask for it.
- 3—Because the Golden Giant is advertised extensively and is known to all of your customers.
- 4—Because we furnish you with the sales helps and the sales cooperation to enable you to put Golden Giants over in a big and profitable way.

We believe that it is our duty to help you sell the Golden Giant that you buy from us and we spare no efforts in the performance of that duty.

**BENFORD  
AUTO  
PRODUCTS,  
INC.**  
MT. VERNON,  
N. Y.



# BENFORD'S GOLDEN GIANT

Sell  
yourself



# The USL BATTERY

TO "SELL YOURSELF" on USL all you have to do is to study its points of *superiority*.

For example, compare the USL *exclusive machine-pasted plates* with the unreliable, old-style, hand-pasted plates.

Then observe carefully the USL *patented top* with its *improved filling tube*.

Then check up the USL *Dry-Charged shipping method* which makes sure that the life of your battery begins the day you get it.

And finally, bear in mind that USL batteries are sold on a *15-months, guaranteed adjustment plan*.

When you have thus *studied, compared, observed* and *checked up*, you will have "sold yourself" on USL and with a USL in your automobile you will remain sold as long as you are a car owner.

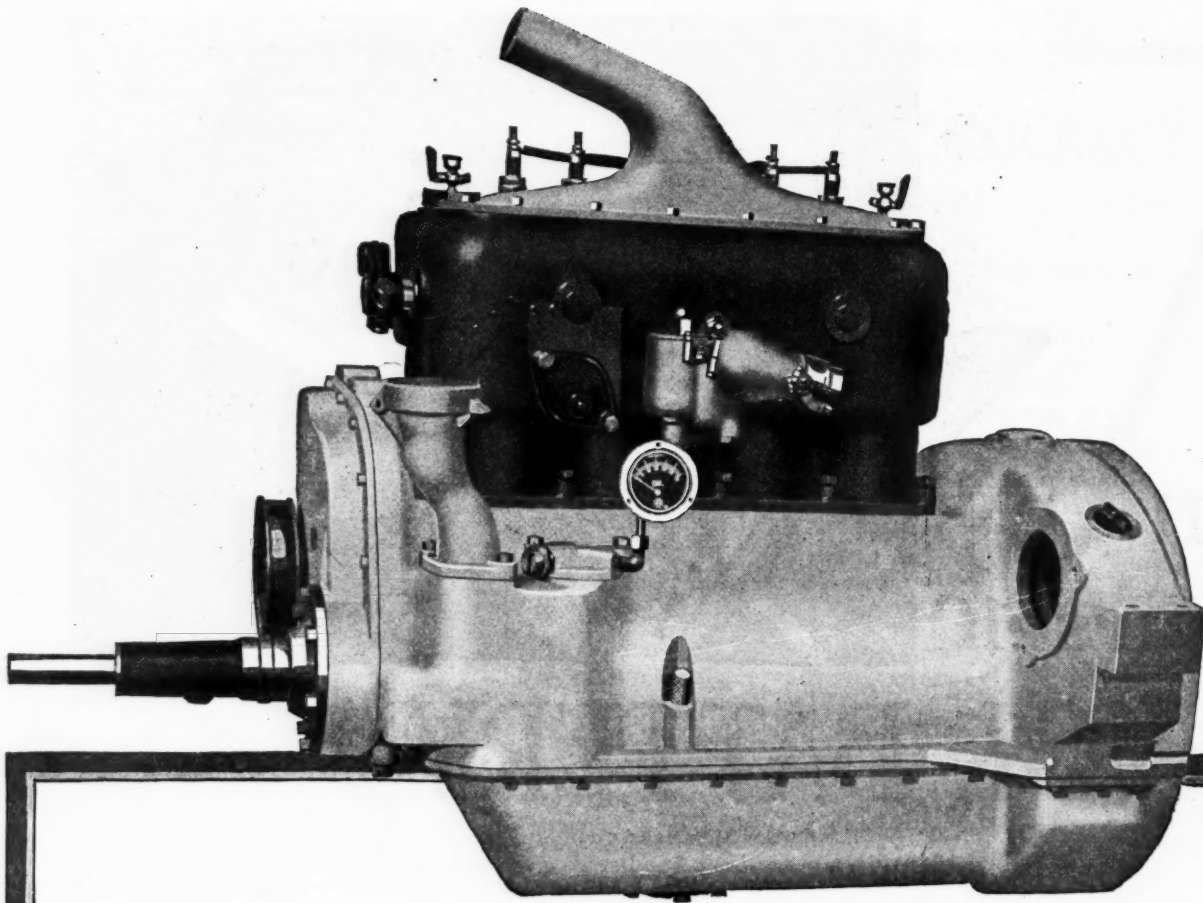
U. S. Light & Heat Corporation, Niagara Falls, N. Y.



**FREE** Our 50-cent Battery Book that answers every battery question. It's a book you can't afford to be without if you own or drive an automobile. It's free if you mention the make and model of your car.

# storage batteries





## A Superfine Motor for Passenger Cars

The G. B. & S. Model "AA" was designed for hard work. It was built for long life.

But, more than that, its power showing is extraordinary—its operation so surprisingly smooth and effortless that it is everywhere attracting the keen interest of passenger car builders who recognize the big immediate opportunity for a superfine four.

On a recent test in a passenger car, it showed accelerative ability that proved amazing to those who witnessed its performance. Its quick pick-up from low to high speeds was declared marvelous in a four.

Its hill climbing ability was pronounced simply astonishing.

Perfect balance was shown at all speeds.

These are not mere statements. They are actual facts. The motor will verify them.

The consensus of opinion of those present was to the effect that it was the finest four cylinder motor of its bore and stroke they had ever seen.

The G. B. & S. Model "AA" weighs 425 pounds complete. Both upper and lower crankcases are LYNITE. It features great strength, large bearings, large finely finished crankshaft, positive lubrication, simplicity and accessibility.

It is the honest opinion of those who know it that, in addition to its utility in the truck and tractor field, it is a superfine motor for a superfine four.

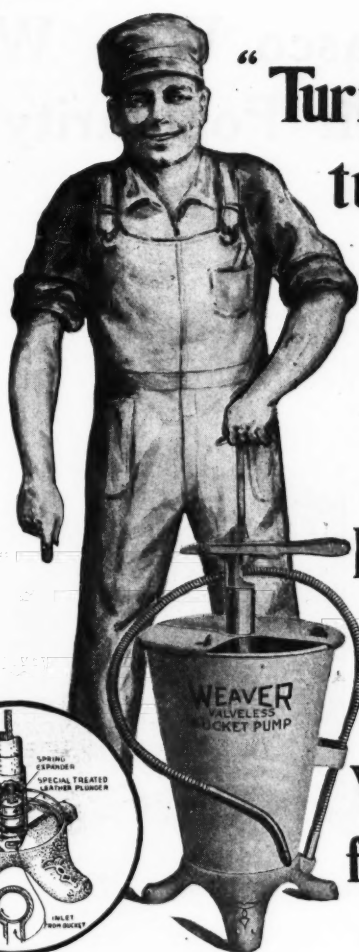
*For further information write:*

**GOLDEN, BELKNAP & SWARTZ COMPANY**  
**Detroit, U. S. A.**

Export Dept. 100 Broad St., New York City  
 London—Paris

# **G-B&S motors**

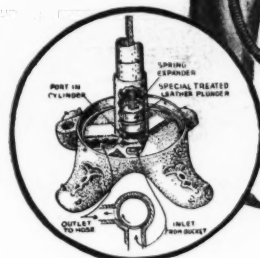
"Turning the handle  
turns the Trick"



It instantly adapts the

**WEAVER**

**VALVELESS Bucket-Pump**  
for filling or emptying



PUMPING IN  
FRESH LUBRICANT



DRAWING OUT  
OLD LUBRICANT



CLEANING A  
DIFFERENTIAL AND  
RENEWING THE LUBRICANT

Down at the base of the plunger cylinder are two portholes. It is the action of these two ports which makes it possible for the **WEAVER Valveless Bucket Pump** to do things which no other lubricant pump can do.

A turn of the plunger handle to the right opens the port into the bucket proper. An upward stroke of the plunger—and the cylinder sucks up a pound of lubricant.

A turn of the plunger handle to the left opens the port to the outlet hose (closing the other). A downward stroke on the plunger, and the cylinder's charge is transferred to the place to be lubricated.

Reversing the process is just as easy. Suppose you want to draw old grease or oil from differential or transmission. Simply insert the Weaver hose nozzle in the housing, open the outlet port and pull up on the plunger. Then remove the nozzle from the housing and thrust it into the receptacle intended to receive the old lubricant. A downward thrust of the plunger and the job is done.

### Handling Two Lubricants At One Time

One special advantage of the **WEAVER** lies in the fact that it can handle two kinds of lubricant at one time without mixing them. The bucket proper may be full of engine oil, but the plunger can be operated independently to handle grease from another receptacle without disturbing the lubricant in the bucket.

This makes it possible to draw old grease or oil from a car part, cleanse the mechanism with kerosene, and pump in fresh lubricant from bucket. The whole operation can be performed within a few minutes—with the very minimum of steps and labor.

The **WEAVER Valveless Bucket Pump** is one of the most interesting of the large family of **WEAVER GARAGE ACCESSORIES**. It is simplifying the countless lubrication jobs which arise every day in every garage. Men who work with it once make friends with it immediately.

WRITE FOR OUR COMPLETE CATALOG.

**Weaver Mfg. Co.,** 2165-79 South Ninth St., **Springfield, Ills.**

THE HOSE is made extra long to reach the inaccessible places with ease. And it is made of metal, packed with asbestos, to insure durability and long life.

THE AUXILIARY LEVER on the plunger facilitates operation in cramped quarters—where there is not room to exert full pressure upon the plunger handle.

THE LID is made in two telescoping sections. These permit of easy closing when desired. And, when opened, afford adequate room for filling.



# The Beauty and Quality of Pasco Wire Wheels Is the Foundation of Their Popularity

The desire on the part of the majority of motorists for greater attractiveness and individuality in their cars is one of the big moving factors in the automobile trade. It is responsible for a big part of the demand for Pasco Wire Wheels.

More Pascos, we have found, are sold on account of their handsome appearance and superior quality, than because of any of the exclusive mechanical features which make Pasco Wire Wheels the engineering triumph they are daily proving themselves to be.

Yet these exclusive mechanical features should not be lost sight of, for they secure to users of Pasco Wire Wheels a maximum of safety, economy and all-around convenience.

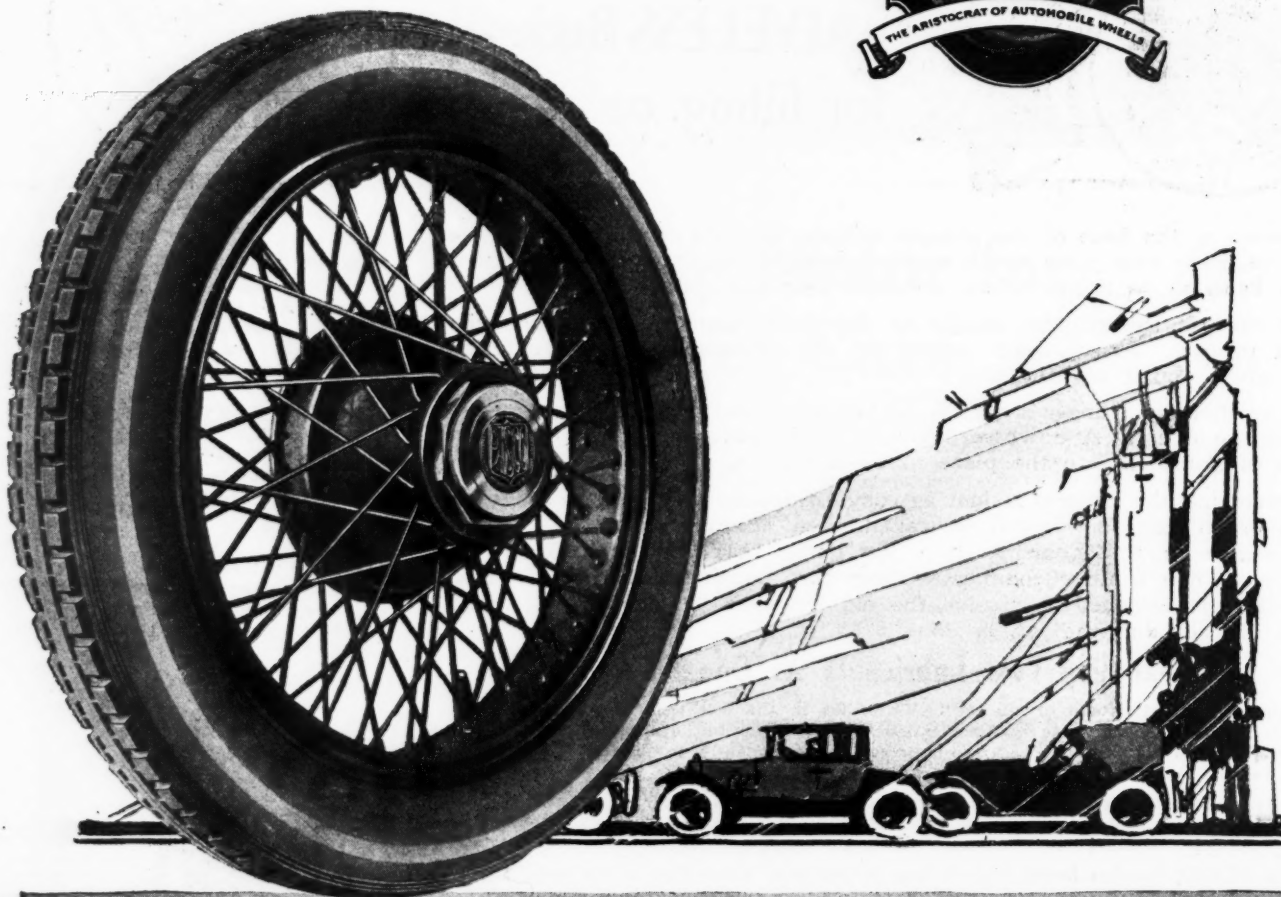
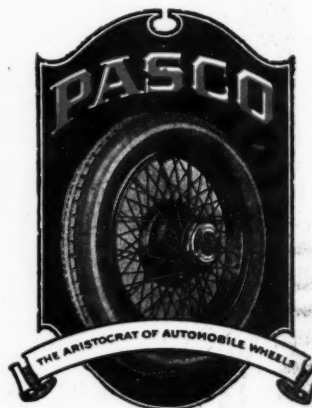
Whether you are a car manufacturer, a dealer or a car-owner, it will pay you to know more about Pasco Wire Wheels.

**National Wire Wheel Works, Inc.**

416-417 Book Bldg., Detroit, Mich.

Plant No. 1—Geneva, N. Y.

Plant No. 2—Hagerstown,  
Md.



# PASCO WIRE WHEELS



You  
Can  
See  
the  
Spark



PRICE  
\$1.50

Mail orders  
filled where  
dealers can-  
not supply  
you.

## Dealers Read This! You Will then want to handle Viz-Spark

It has long been known that a double jump spark plug has greatly increased intensity. How to apply this to spark plugs remained unsolved until Viz-Spark was invented. In applying the double jump, and by placing one of the jumps in the top of the plug, we get that other great feature—visibility. These two exclusive features are housed in a plug that is built big and strong, with unusually heavy porcelain—a plug that will stand the strain of long service.

# VIZ-SPARK

## Opportunity for Dealers, Jobbers and Distributors

Live dealers are handling this new, fast selling plug. It is a sensation wherever introduced. Write us for details. Territory open for experienced men as distributors.

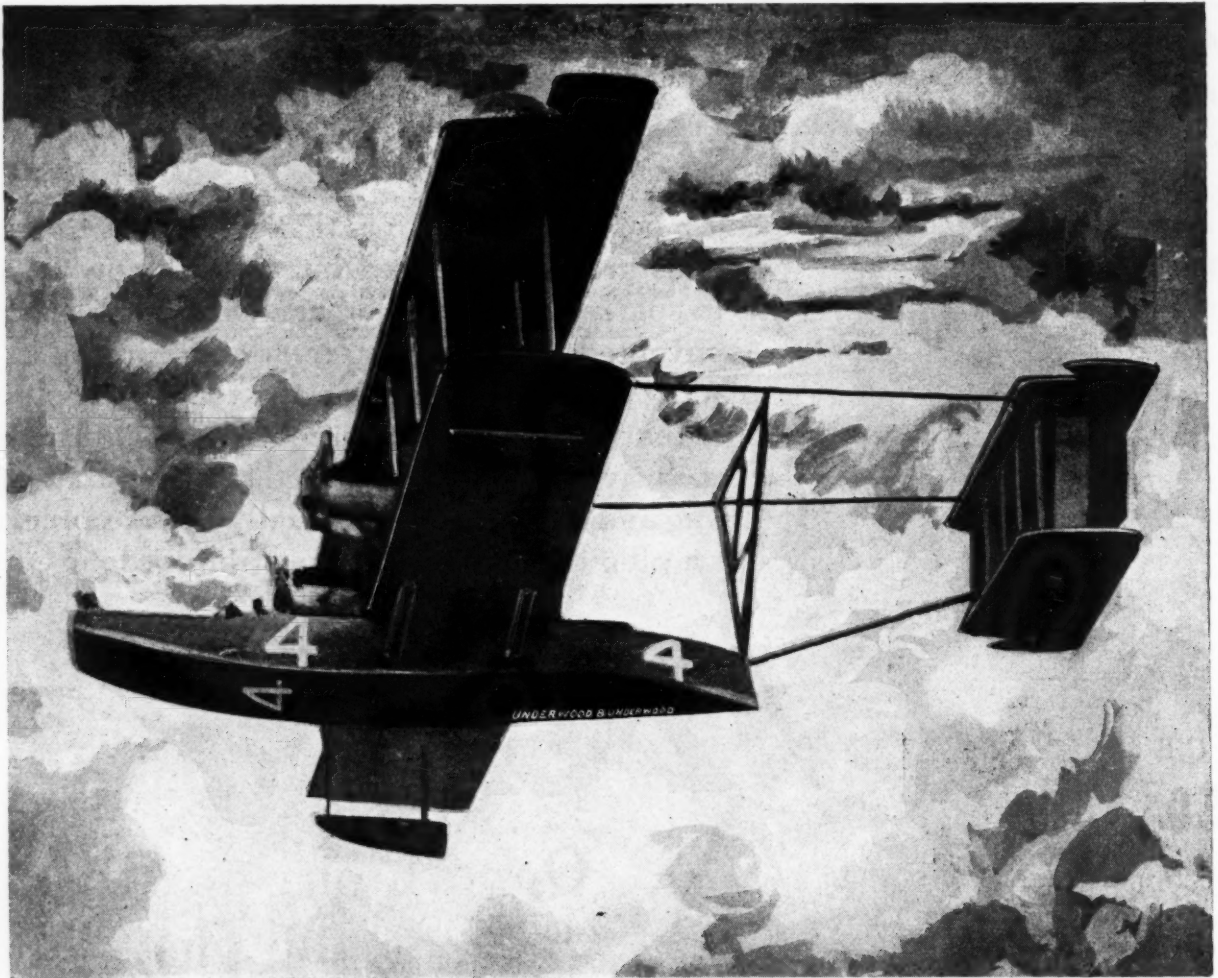
### A New and Practical Application of an Old Principle

About the year 1900 racing car drivers discovered that when a spark plug on their engine went "bad" they could make it work again by forming an auxiliary spark gap outside the engine cylinder. Their methods were crude but temporarily effective. They probably did not know the reason for the results obtained. In Viz-Spark this auxiliary gap is permanently embodied in the design of the plug and is protected by a brass shield topped with a glass lens. The shield protects the gap from dirt, maintaining its condition constant. The glass lens enables the spark to be seen and magnifies it so that it can readily be examined and from its color and size the condition of the compression and ignition systems of the motor ascertained. The auxiliary gap produces an intensified firing spark, which minimizes the gasoline consumption of the engine.

*A booklet fully explaining in detail this wonderful spark plug will be sent upon request to*

**Visible Spark Plug Co.**  
400 McKenna Bldg., Pittsburgh, Pa.





There is *MORE POWER* in  
**THAT GOOD GOOD GULF GASOLINE**  
*and SUPREME AUTO OIL*

*Manufactured by* **GULF REFINING COMPANY, Pittsburgh, Pa.**

**E**FFICIENT, perfect and constant lubrication was the greatest factor in the ultimate success of the adventurous trip of the NC-4. Hence the Navy left nothing to chance. Grilling, practical tests, scientific investigation, exhaustive research, were all combined against the possibility

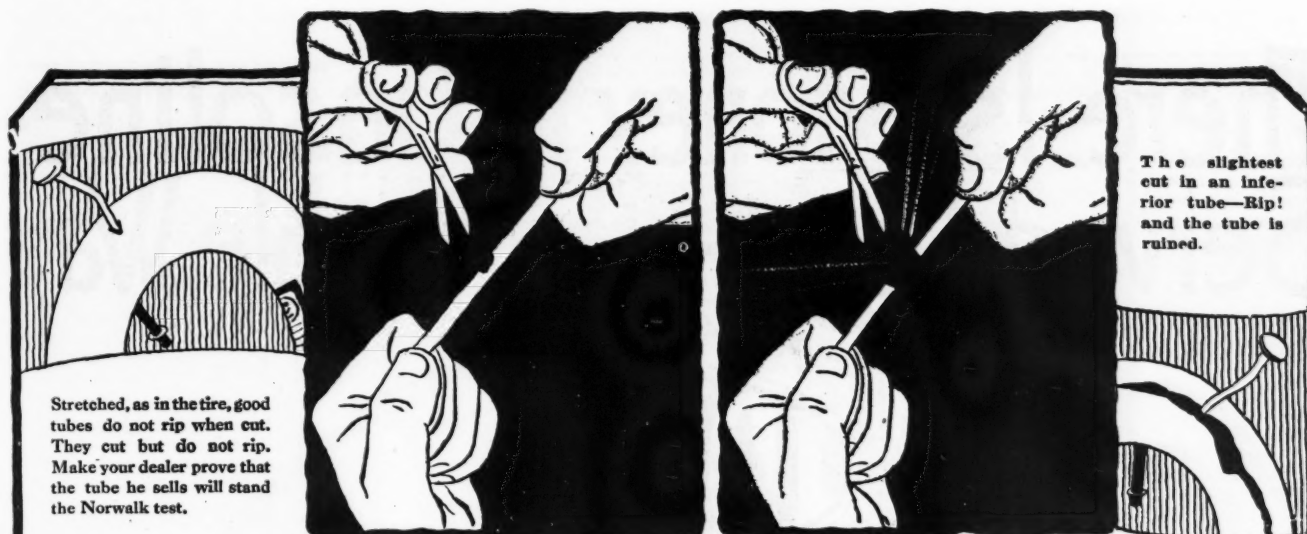
of disastrous engine troubles resulting from poor lubrication.

The choice of GULF LIBERTY AERO OIL therefore, was made with a positive knowledge that it would fulfill every requirement, and the success of the NC-4 has proven the wisdom of the choice.

**SUPPLIED BY**

**GULF REFINING COMPANY**

**Manufacturers of SUPREME AUTO OIL and THAT GOOD GULF GASOLINE**



### *The Scissors Test*

Take test strip  $\frac{1}{4}$  in. by 3 in. Stretch to 9 in. or three times its original length. Cut on the edge with the scissors. The cut should not be more than  $\frac{1}{8}$  in. across the sample. If the strip tears apart the rubber is inferior.

## *The Scissors Test*

Reproduces actual service conditions. You hold the rubber at tension exactly as the air will hold it. The scissors snip is like the edge of a puncture.

This test proves the truth of the Norwalk guarantee; Norwalk Tubes do not rip as other tubes. Cuts can always be repaired. They do not spread.

It proves before you buy, the mileage you can get from Norwalks.

Norwalk Tubes, red and gray, are made of highest grade floating stock.

And there's a Norwalk Casing too.

**NORWALK TIRE & RUBBER CO., NORWALK, CONN.**

*Makers of Casings, Cord and Fabric; and of Tubes, Red and Gray*

Export Office: 100 Broad Street, New York

**DEALERS** If the tubes you are now selling do not meet the Norwalk scissors test, better stock Norwalks at once. This advertisement is one of a series in which we are telling the public how to test tubes before they buy.

# NORWALK

## *TUBES and CASINGS*



Cord casings  
adjusted 8,000  
mile basis.



# There Is Money in Gasoline-Served Right—the Visible Way



*The* day of the "short change" pump and measure which is "taken for granted" to be correct have passed.

Motorists now-a-days insist on patronizing a modern station—where they can see exactly how much gas they are actually getting.

The IDECO assures an honest measure—visible day or night. The five-gallon bottles are accurately gauged and there is no possible chance for a dealer to give too much—or too little. It is the most attractive pump on the market, and operates by the vacuum method.

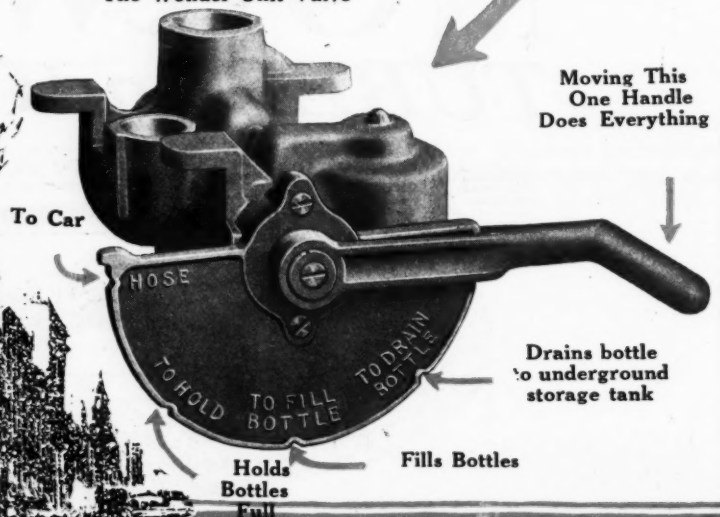
Motorists like the IDECO. They are satisfied and come back repeatedly for more gas. This, in turn, brings a good volume of accessory business and the large volume of gasoline sold due to this increased satisfaction provides a sufficient margin of profit to convert the usual "bother" into a "money maker."

The IDECO "Unit Valve" does all the work. Merely moving the little handle either fills the bottle—holds the gasoline in the bottle—or releases it through the filling hose. It is positively fool-proof.

Our liberal selling proposition offers an exceptional opportunity to special sales representatives. There is still some real good territory open. Now is the time to act.

*Full particulars on request.*

## The Wonder Unit Valve



Moving This One Handle Does Everything

Drains bottle to underground storage tank

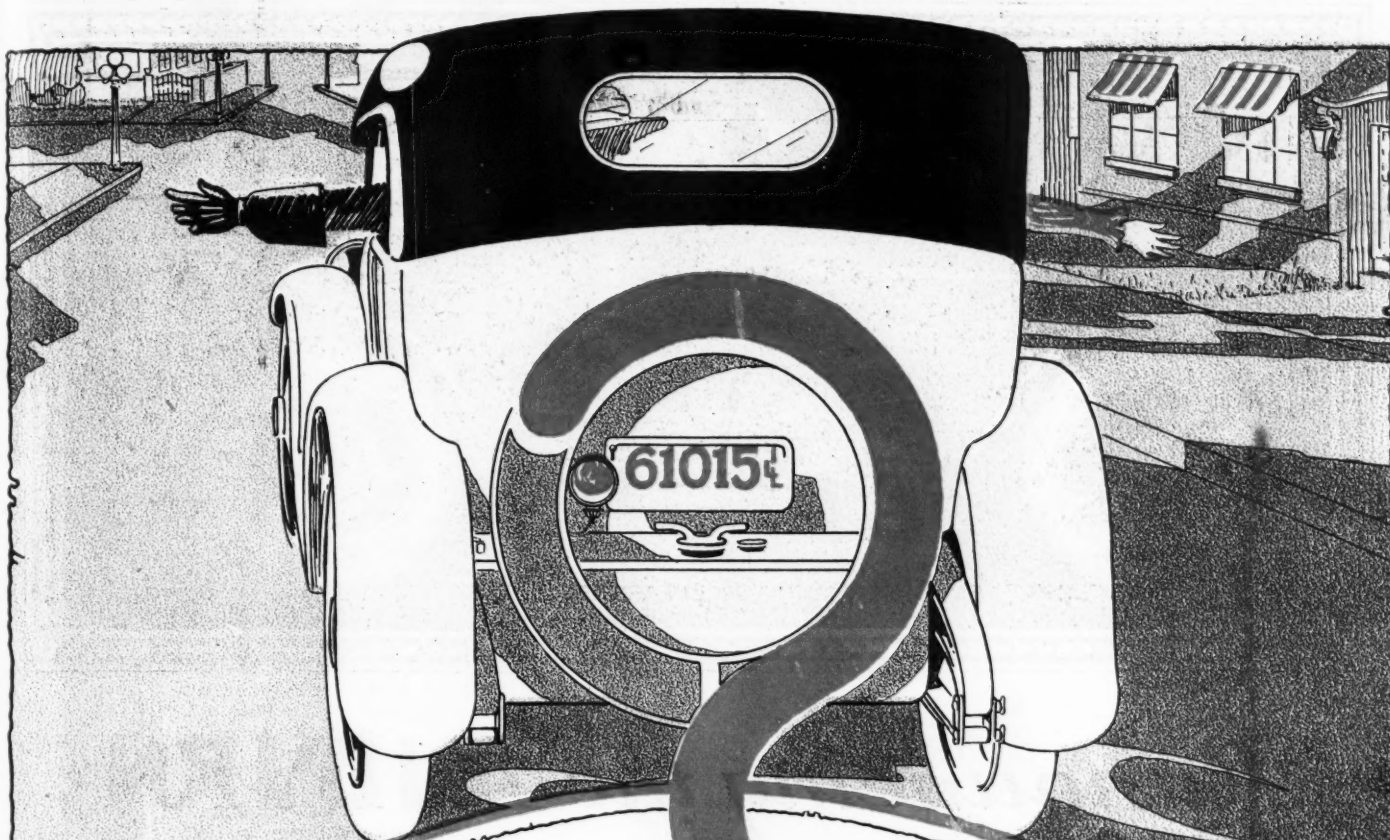
Fills Bottles

Holds Bottles Full

Springfield

**IDECO, Incorporated**  
Mfrs. of Garage Equipment

Illinois



## Now • What!

### Sticking a Hand Out Doesn't Mean Anything Definite

When the man in front sticks out his hand, all you can do is sit tight and wonder if he is going to turn to the right—to the left—or stop entirely.

The AUTO INDICATOR SAFETY SIGNAL informs instantly. It is a complete combination of signals, FOUR-IN-ONE, positively preventing accidents, indicating right and left turn. STOP and GO, as needed. It is simple in construction; automatically controlled; easy to operate; requires no thought; convenient to use; attractive in appearance; effective in action; not expensive and requires no expense for up-keep. The FOUR-IN-ONE is an absolute protection.

The AUTO INDICATOR is not electrical except in so far as any ordinary tail light is, having an electrical bulb and socket. It is about 3 in. by 4 in. and can be attached to the fender or in any other position on the rear of the car as is made necessary by the location of the gas filler cap or by existing legislation. A most impressive feature of this device is that it demands attention owing to the fact that at night the color changes from red to white in changing from the word "GO" to "STOP".

The AUTO INDICATOR functions properly under any and all braking conditions. It works just as properly if the brake is applied lightly to simply slow the car down as it does if the brake is engaged to the limit to stop the car suddenly. The AUTO INDICATOR can be installed by any one on any car in less than two hours. It positively cannot interfere with the functioning of the brakes in any way.



**AUTO INDICATOR COMPANY**  
Grand Rapids Michigan

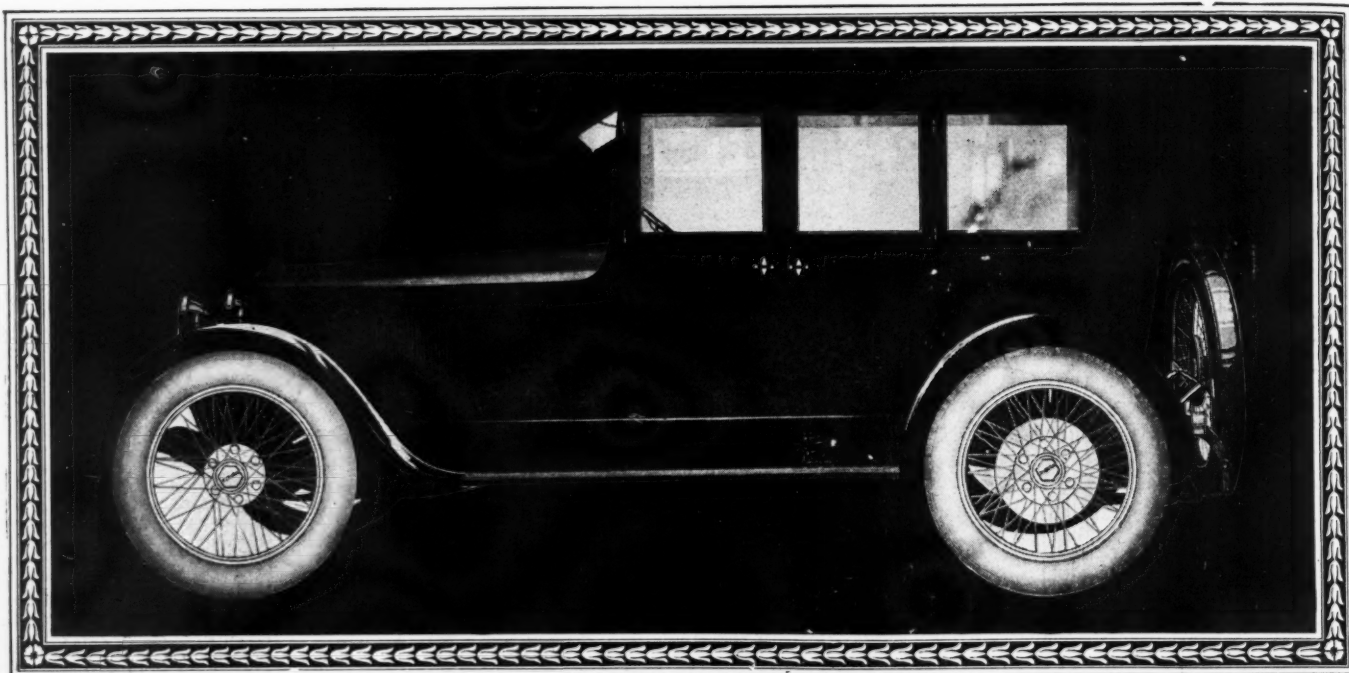
There is a big demand for the AUTO INDICATOR SAFETY SIGNAL. It is just as valuable to safety as the brakes themselves. Motorists realize more each day the value of a few dollars invested to save expensive accidents or even loss of life. Dealers and jobbers are cashing in big on this device. The market is big—the selling price reasonable—and the profits are right.

#### COAST REPRESENTATIVE:

**Norman Cowan Company**  
445-451 Rialto Bldg.,  
San Francisco, Calif.

**SPECIAL TERRITORY PROPOSITION** Open for State Representatives





## *Announcing the* **AUBURN** **Beauty-SIX Sedan**

The Auburn Beauty-SIX Sedan is announced in response to an oft-reiterated demand of Auburn dealers and the motoring public.

In the production of closed models, the Auburn Company occupies a commanding position. The men who build Auburn bodies are trained carriage builders. Many of them have been long engaged in the construction of coachwork widely known for its beauty and enduring worth. Their ideals permeate the Auburn shops. The result is models of surpassing charm.

The Beauty-SIX is now offered in five models—Five Pass. Sedan, \$2375; Four Pass. Coupe, \$2375; Five Pass. Touring, \$1695; Four Pass. Tourster, \$1695; Two Pass. Roadster, \$1695.

A complete line of open and closed models—nineteen years of successful experience—recent expansion insuring greatly increased production—dominant national advertising—and owner and goodwill make an Auburn franchise the choicest dealer plum in present day motordom. Desirable territory is still open. Write for particulars.



**AUBURN AUTOMOBILE CO.**  
AUBURN, INDIANA



# H&D

## SHOCK ABSORBERS

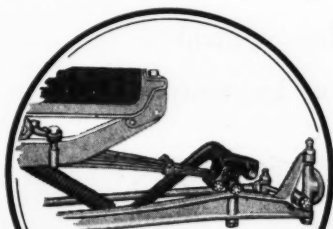
*'Single or Twin Arm'*

### One after another—all making their own roads smooth—with H. & D. SHOCK ABSORBERS

Ford cars have made possible the bringing together of a Nation's widely distributed populace.

H. & D. SHOCK ABSORBERS have made possible an ease of riding in Ford cars over roads which otherwise it would be practically impossible to negotiate with any degree of comfort.

H. & D. dealers, like H. & D. owners, have long appreciated the unequalled advantages—and the exceptional profits—resulting from the use and sale of the most efficient shock absorbers for Fords on the market—The H. & D. Single or Twin Types.

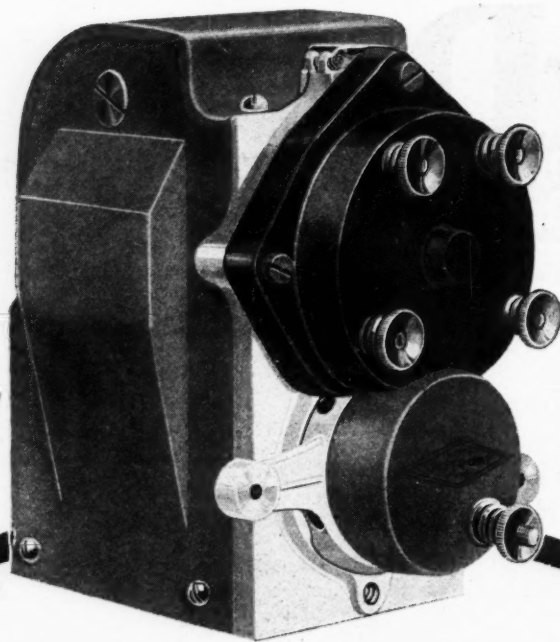


U. S. Patents—May 8,  
1918; April 23, 1918.  
Letters Patent in  
Canada.

**H. & D. COMPANY, Inc.**  
Goodland, Ind.

In Canada  
Richards-Wilcox Canadian Co., Ltd.  
London, Ont.





## Not canned ignition-but real fresh juice right from the magneto

Splitdorf Magnetos are not cans of current that depend upon a complicated system of battery, generation and control for their efficiency—

Their strength is not fixed by a source beyond their control—

Their volume is not measured by four walls, or by temperature, or by chemical reaction—

They will not burn out through overloading—

They are self-contained, independent, highly efficient sources of current, whose only function is to fire your engine—and whose only master is the engine that drives them.

They create a stronger spark at starting speeds than any other system at full engine speed, and the strength of the spark increases with the speed of the engine. This is not true of any other ignition system.

# SPLITDORF

Electrical Co., Newark, N.J.

Sumter Division, 1466 Michigan Ave. Chicago



Manufacturers of AERO, DIXIE and SUMTER Magnetos, Oscillating Magnetos and Impulse Starters

# A Quarter Turn of the Crank Starts the Heaviest Magneto-Equipped Engine

*The Safety Impulse Starter Banishes the Back-Fire Menace  
And the Back-Breaking Strain of Cranking. Fits Any Magneto*

**C**RANKING a heavy truck tractor engine is just about the meanest part of a driver's job. He's human enough to avoid it—leave the engine idling—whenever he can. And that's wasteful.

So the impulse starter was devised. It took quick hold—succeeded—reduced starting to a partial turn of the crank. But its limitations were severe: It fitted only the particular make of magneto for which it was built, and only a few magneto makers adopted it.

Then came the Safety Impulse Starter—the universal starter that fits any magneto. And with it all limitations vanished. It stopped

back-firing—absolutely and permanently. No danger of broken arms. Approximately a quarter turn of the crank starts the magneto spinning—any magneto—and fires the motor at once.

**It is simple:** Only 10 parts as against upward of 40 in other makes. **It is sturdy and fool-proof:** Will outlast the magneto, and requires no tinkering or adjusting. **Its spring is strongly housed:** And spring breakage (an unlikely thing) cannot possibly interfere with timing or in any way disturb the proper functioning of the magneto—true of no other impulse starter. **Easily installed:** Any one can do it in an hour.

Truck and tractor manufacturers have a big sales-maker in the Safety Impulse Starter. It talks for itself—gets the quick and enthusiastic interest of truck and

tractor buyers. It is an undoubted asset.

**Dealers, Garagemen, Repairmen:** Every truck and tractor owner in your territory will be strong for the Safety Impulse Starter the minute he sees what it can do—when he realizes that it will fit his type of magneto—ANY type of magneto. Write for trade discounts and full details.

The price is \$10.00, complete, with universal couplings.

**SAFETY IMPULSE  
STARTER CO.**

325 North 15th Street,

Philadelphia, Pa.

## SAFETY Impulse Starter

"FOR TRUCKS AND TRACTORS"



### Fits any Type of Magneto

RETAIL PRICE

**\$ 10.00**  
including  
universal  
coupling and  
all necessary  
fittings



NEW

*Mitchell*

SIXES

## Our Victory Model

A TWO-YEAR REVISION—OVER 100 IMPROVEMENTS

### A Good Six to Sell

*These are some of the reasons why so many leading dealers now seek a Mitchell alliance.*

The new Mitchell Six is a great car. No one who knows will deny that.

The thousands now running are spreading the facts about it. Our advertising is every month telling the facts to millions.

The result is a nation-wide demand which is breaking all Mitchell records.

#### *A Safe Future*

With such a car, the Mitchell future is safe, and Mitchell dealers share it.

The pre-war Mitchell was a 14 year development. Yet this new model—a two-year revision—presents a hundred improvements.

To scores of parts we have added strength. We have greatly improved the motor.

We have spent over \$300,000 on new machinery and equipment—all for finer workmanship and more exacting tests.

Fuel cost and upkeep cost have been reduced in many important ways.

We are building a car which, year after year, will increase the prestige of the Mitchell. Every man who knows a good car will recognize that.

And it's a beautiful car. The design is new, the color, the finish, the top, the equipment. The model is impressive and the details show the final touch.

#### *A Unique Value*

The Mitchell factory is big and up-to-date. Factory efficiency has been developed far. The entire plant has been built and equipped to produce this type economically.

We build the complete car—motor, chassis and body. We build it under modern cost-reducing methods.

So we give in the Mitchell the greatest value to be found in a car of this class.

#### *Fine Organization*

In the past two years we have added largely to the Mitchell staff. Scores

of new specialists have been employed. This organization is now distinguished for its many able men.

This spirit is appealing. Our men are not transients—they live here. Many of them, fathers and sons, have worked all their lives for Mitchell. They are working with us to build a car which will build this institution.

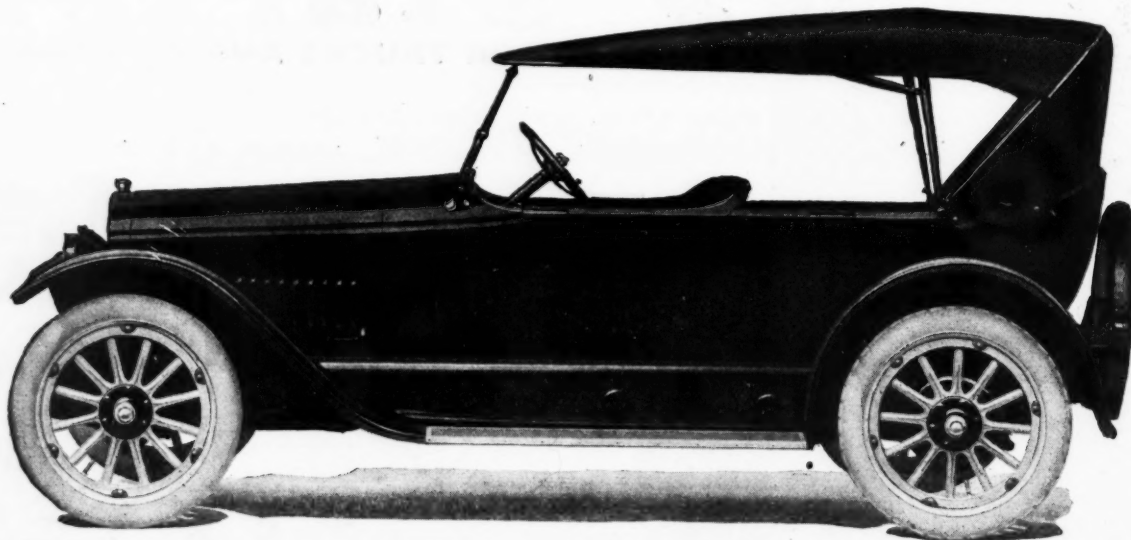
The car has attracted the ablest distributors. So Mitchell dealers work with high-class men.

We invite investigation of this new Six, this model factory, this great organization. The facts will appeal to leading dealers—dealers with much at stake. In some desirable localities there is room for such men. Write or come and see us.

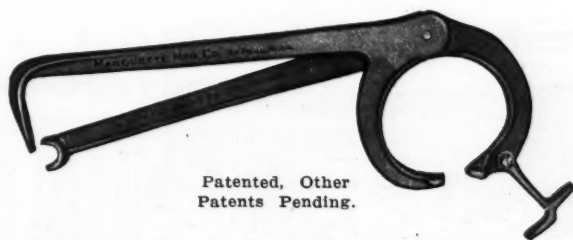
5-Passenger Touring Car—\$1690 f.o.b. Factory  
120-Inch Wheelbase—40 h. p. Motor  
3-Passenger Roadster, same price  
Also built as Sedan and Coupe

7-Passenger Touring Car—\$1875 f.o.b. Factory  
127-Inch Wheelbase—48 h. p. Motor

MITCHELL MOTORS COMPANY, Inc.  
Racine, Wisconsin

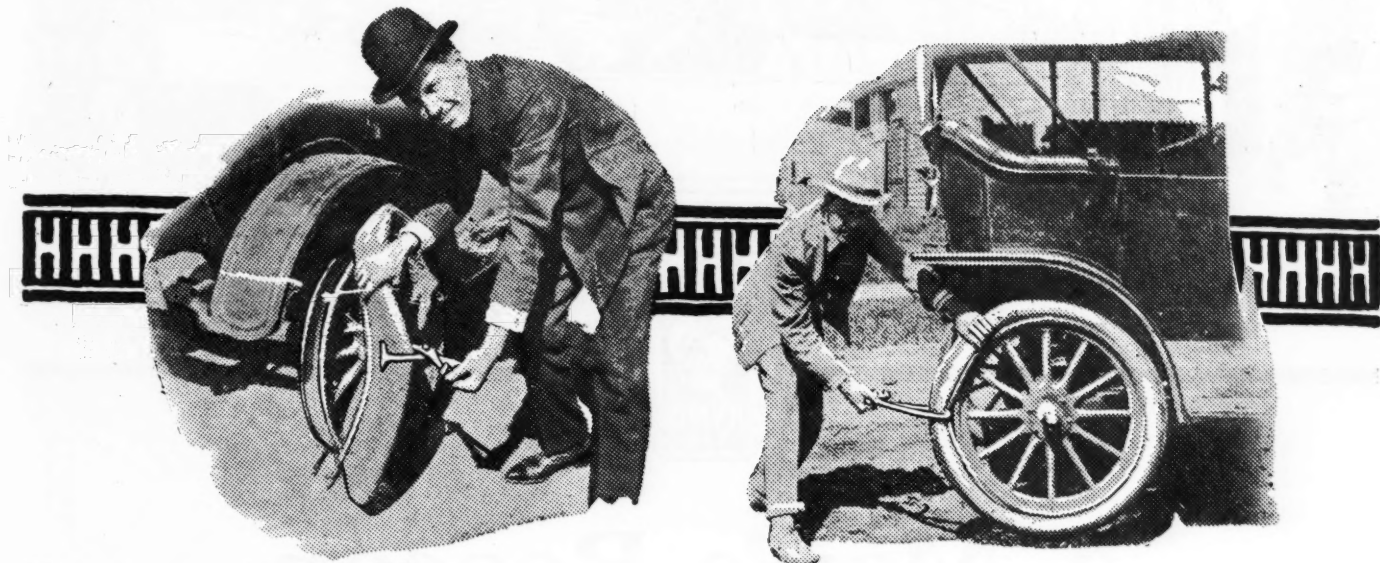


Only Real  
Tire Tool on  
the Market



Patented, Other  
Patents Pending.

A Ready  
Seller  
Everywhere



*Coming off*

*Going on*

## Marquette Tire Tool—

**Dealers:** Here is one tire tool that is a dandy. It can't be equalled for service and utility. It positively does the work—and it does it quickly and without any effort at all. The MARQUETTE makes it possible to change clincher tires quicker than demountable rims.

And it sells *readily* and *steadily*.

## Marquette Luggage Carrier—

The MARQUETTE LUGGAGE CARRIER is the *Genuine All Steel Carrier* designed to fit every car.

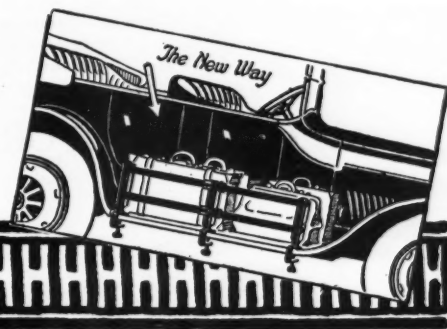
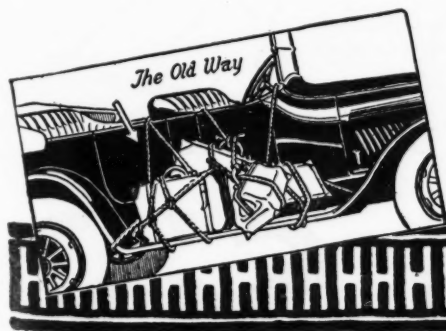
Can be adjusted to any length running board. Folds down neatly to running board when not in use. Attached in a moment—no wrench or tool needed.

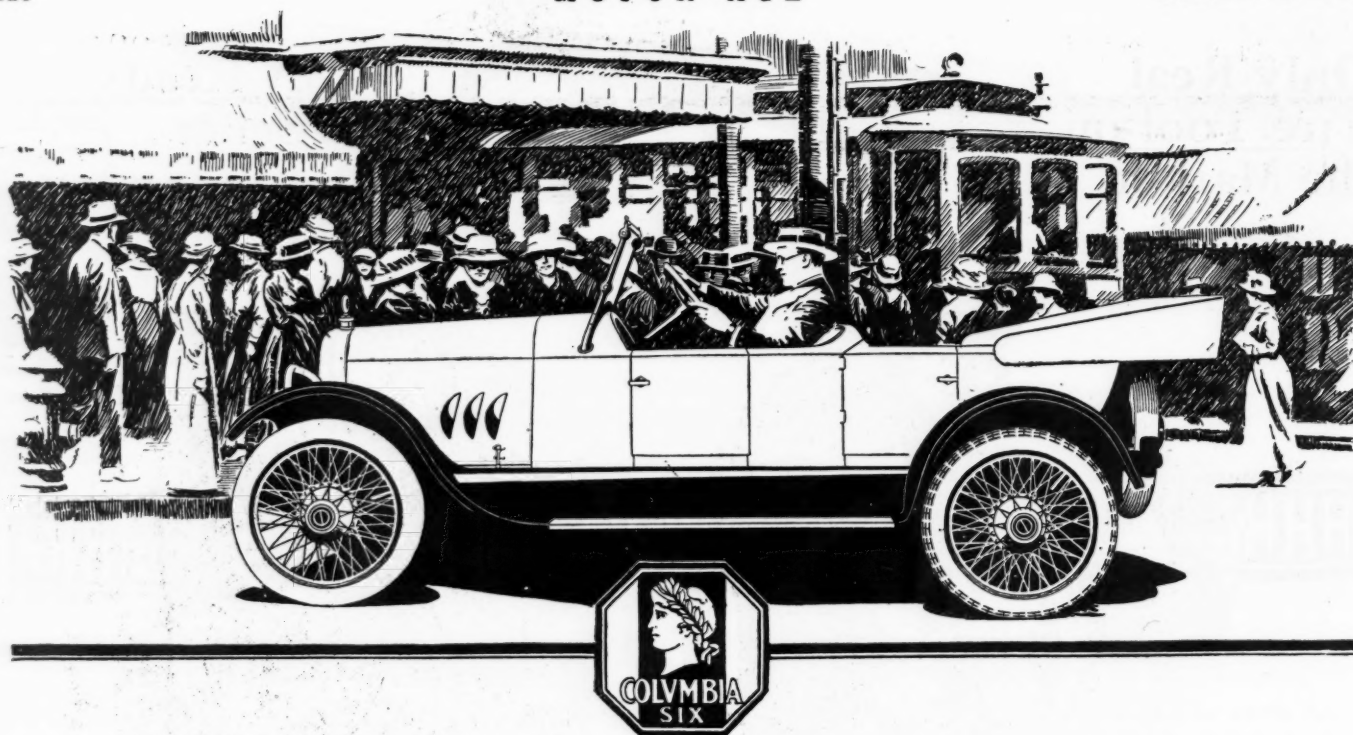
**Dealers—** Beware of imitations—our goods are patented. Full particulars and illustrated literature on request.

Marquette Mfg. Co. Inc.

St. Paul,  
Minn.

Sole Manufacturers





## A Man's Reason

*Men, Too, Like the Columbia Six*

Ask any man who drives a Columbia Six and he will tell you that from a sound, practical, business-like standpoint the Columbia Six appeals to him because it is thoroughly reliable — built by a substantial organization and is wonderfully economical both in up-keep and depreciation.

Columbia dealers throughout the country tell us that they looked long for a car that would appeal on a business basis to a man as the Columbia Six does.

A Columbia sales agreement is a positive assurance of a growing business for years to come.

**Note that the Columbia Six is  
Good All the Way Through**

*Timken Axles—Continental Red Seal Motor—Detroit Pressed Steel Company Frame—Radiator with "Sylphon" Thermostatically Controlled Shutters—Spicer Universal Joints—Borg & Beck Clutch—Detroit Steel Products Company's Springs—Gemmer Steering Gear—Auto Lite Starting & Lighting—Atwater-Kent Ignition—Stromberg Carburetor—Prest-O-Lite Storage Battery—Painting and Trimming by The American Auto Trimming Co.—Pantasote Top.*

COLUMBIA MOTORS CO.

DETROIT, U. S. A.

# Columbia Six



# ALL IN Takes the Place of Them All

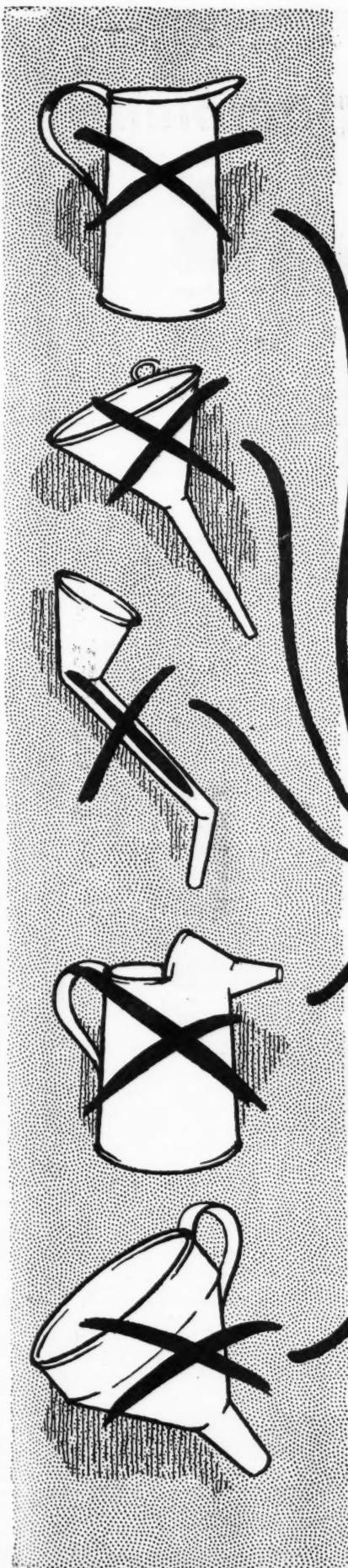
Now you can get rid of the old-fashioned funnels and measures that never were any good anyway, that wasted oil and were always of more nuisance than use. This new All-In-One combined measure and funnel holds the oil, measures it and delivers it just where you want it, easily, and without waste, and without muss.

Made of coppered metal, strong and durable. Flexible nozzle fits into any oil receptacle on the car or truck. Thumb valve lever makes it possible to start and stop the flow whenever you wish.

Get this splendid money-saving convenience today. Write

Sales Department

**THE BAILEY-DRAKE COMPANY, Inc.**  
1120 S. Michigan Ave., Chicago, Illinois



**LIST**  
Coppered, \$3.50  
Tinned, 3.25



Packard



Pierce-Arrow



Peerless



White



Buick



Studebaker



Kissel Kar



Moline-Knight



Auburn



Essex



Hudson



Chandler



Dodge



Oldsmobile



Hupmobile



Chalmers



Ford Government Ambulance



General Motors Government Ambulance



## Standard Equipment

# GABRIEL SNUBBERS

Make Your Car Ride Easier and Last Longer

## All These Cars

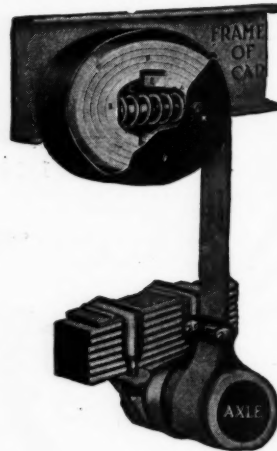
are either standard equipped at the factory with Gabriel Snubbers or have holes in the frame ready to apply them.

Standardization is further proof that Snubbers serve best in making cars ride easier and last longer.

### GABRIEL MFG. CO.

1415 East 40th St.

CLEVELAND, OHIO

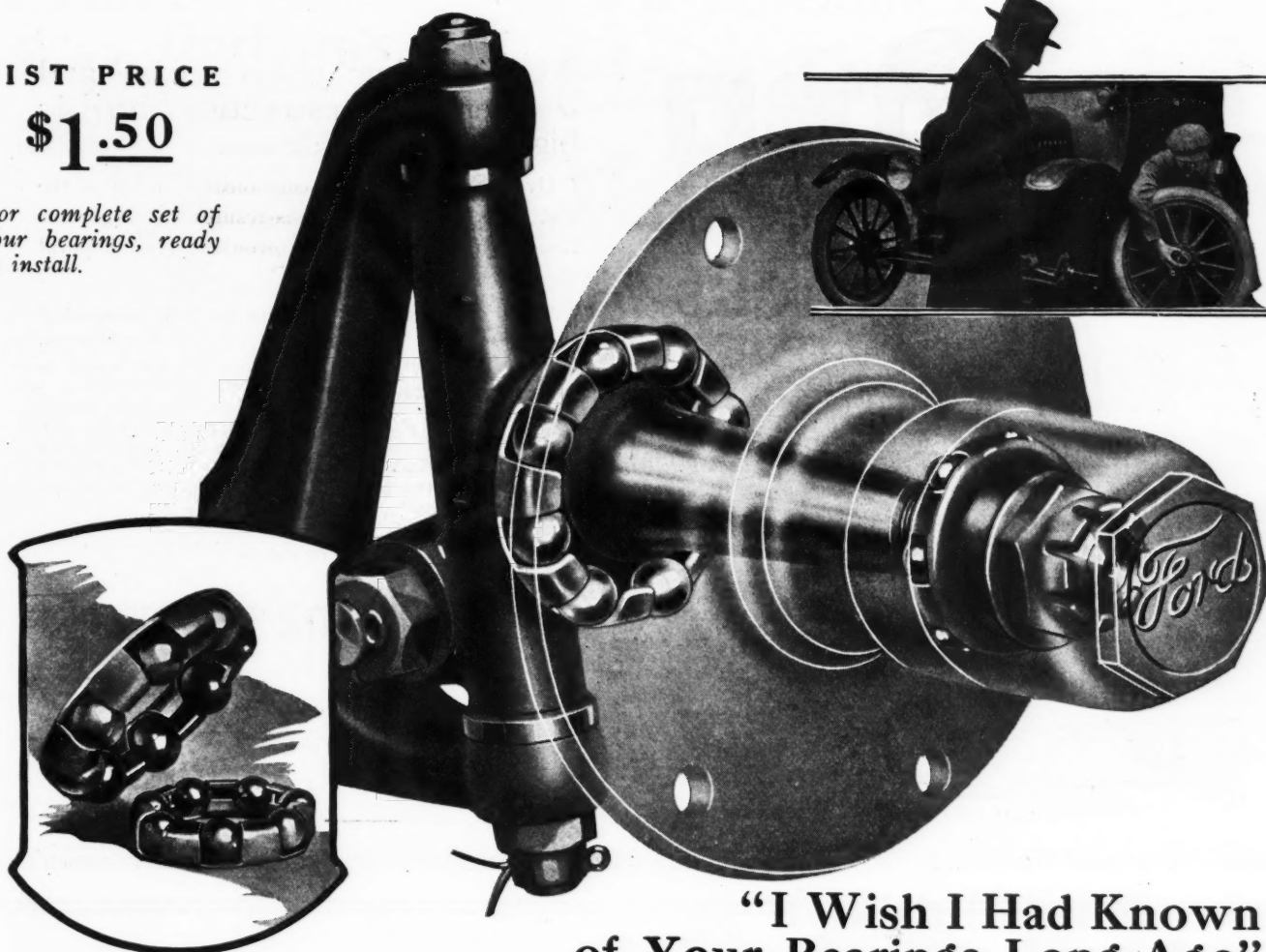


GABRIEL SNUBBERS keep the car from bouncing just as easily as the boy holds the bull—it's the COIL that does the trick.

## LIST PRICE

**\$1.50**

For complete set of  
four bearings, ready  
to install.



## "I Wish I Had Known of Your Bearings Long Ago"

"BEFORE we installed Goodrich National Bearings on our two Ford trucks we found it necessary to make a weekly inspection of the bearings, and generally found them broken and jammed," writes an enthusiastic user of Goodrich National Bearings. And then he continues:

### Save Time and Repairs

"Since we began using the Goodrich National Bearings we have had no trouble whatever with the front wheel bearings, no broken balls, no jamming, no grinding of parts. We don't waste a lot of valuable time tearing down and adjusting the front wheels as we formerly did.

"Our mechanic told us the other

day that since he had installed your bearings he had taken the front wheels off only once in six weeks, and then only to lubricate them. He found them in perfect condition.

"Our garage foreman had tried everything in the way of roller bearings for the front wheels, and he says Goodrich National Bearings are superior to all others because they do not force out the grease and do not attract or draw in dirt or dust."

### One-fifth the Price of Ordinary Bearings

If you want your front axle to give trouble-free service, secure a set of Goodrich National Ball Retainers—an investment that is at once inexpen-

sive and profitable. Ask your dealer or write direct. \$1.50 for complete set, 4 bearings, ready to install.

### Dealers and Repairmen

Don't lay this advertisement aside until you have written out an order for at least a sample set. If you or your customer are not thoroughly satisfied at any time, we will refund your purchase price. You'll make a lot of new friends.

GOODRICH-LENHART  
MANUFACTURING CO.

Factory: Hamburg, Pa.

GOODRICH NATIONAL BALL BEARINGS cost about one-fifth the price of the ordinary ball bearings or roller bearings—yet they are more serviceable and efficient than the far costlier product, and are so guaranteed.

The balls are made of the highest quality steel, which insures long life and complete satisfaction.

Can be easily and quickly installed by anyone. No changes to make. Goodrich National Bearings merely take the place of your present bearings.

# Goodrich National

## BALL BEARINGS for the FORD and CHEVROLET 490



# JUMBO

## OVERSIZE

# Motor Trucks

*Guaranteed for a  
Full Year*



Full Line of Sizes

**JUMBO** low upkeep cost and oversize construction builds big business for dealers.

Oversize construction, combined with use of the best units money can buy, is resulting in a greater freedom from repairs than even the most hopeful user expects.

Jumbo trucks are fast proving the most economical and dependable transportation units in America. Honestly built—honestly sold—every Jumbo truck is backed by a full year guarantee.

There isn't a single dissatisfied Jumbo user in the country that we know of. There isn't a single Jumbo dealer that is not making money. These facts should convince you that the Jumbo proposition is worth looking into.

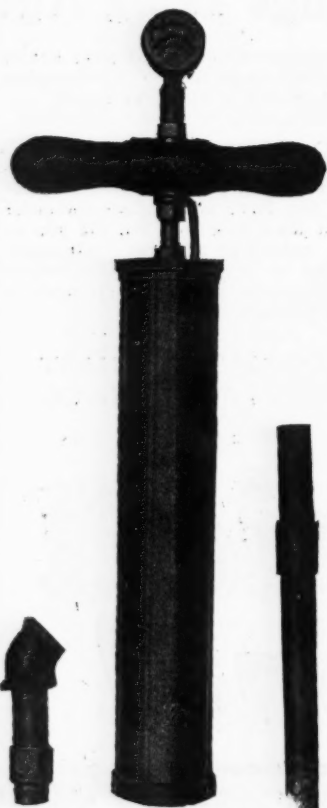
*Write for details*

## NELSON MOTOR TRUCK CO.

Saginaw, Michigan

John Simmons Co., 102-110 Centre St.,  
New York City

Eastern distributors and export representatives



## HAMMETT MOTOR TESTER

### Locates Every Knock in the Motor

Locates, with never failing accuracy, loose wrist pins, piston slaps, connecting rod and main bearing knocks, leaky valves and piston rings—when motor is not running and spark plugs are removed. Right in your own shop you can locate in a few minutes any knock in the motor, and when the adjustment has been made you can make sure that the repair is perfect.

Each cylinder is tested separately and you locate exactly where the trouble is. All guessing is eliminated. The old method of testing the motor on a hill or hard pull is done away with. Time saved in locating trouble on a few jobs will easily pay for the Hammett Motor Tester.

#### Ten Day Trial Offer

Order a Hammett Motor Tester and try it out for ten days. If you are not perfectly satisfied, return the tester and every cent of your money will be refunded. Order your tester under this ten-day offer at once.

**JOBBER:** We have a proposition for you. Write for details.

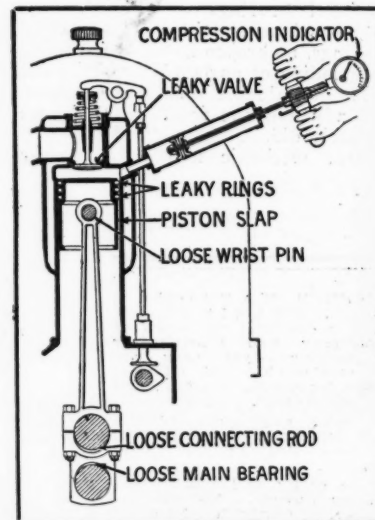
**Hammett Manufacturing Co.**

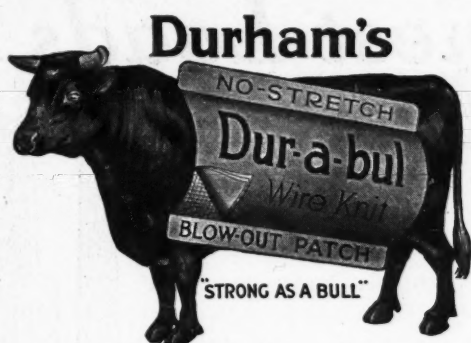
207 E. 18th Street, Kansas City, Missouri

#### Middle West Distributors

Herring Motor Co., Des Moines, Ia.  
Kopac Bros., Omaha, Neb.  
Reinhard Bros., Minneapolis, Minn.  
Johnson Bros. Auto Supply Co., Wichita, Kan.  
W. A. L. Thompson Hdw., Topeka, Kan.  
Voight Tire Co., Atchison, Kan.  
Garage Equipment Co., Kansas City, Mo.

Order from your nearest dealer.





## How Durham's DUR-A-BUL Blow-Out Patch Is Made

Three products enter into the construction of Durham's Dur-A-Bul Blow-Out Patch. Two of them, rubber and cotton fabric, are found in **any** patch—the third is found **only** in the Durham Patch. This third product is **steel** in the form of knit steel wire which gives the patch remarkable strength. This wire mesh prevents all possibility of stretching thereby doubling the efficiency of the patch. The cushion filler, however, allows ample flexibility.

A Durham Dur-A-Bul Blow-Out Patch will more than double the mileage and keep pressure from working hole larger. In other words, the ideal blow-out patch has at last been produced.

### Jobbers—Dealers

Upon request we will send free to any established jobber or dealer one full sized patch which can be used for test purposes. We want you to be the judge, for we know this test will prove the Durabul patch is more efficient.

*Write for your sample and our proposition.*

**DURHAM MANUFACTURING CO.**

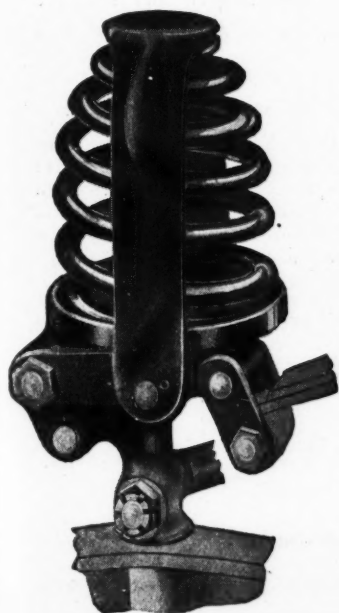
230 Rialto Bldg.

Kansas City, Mo.



# HALLADAY

## Direct Suspension Shock Absorber



### Compare It Point by Point With Any Other FORD SHOCK ABSORBER on the Market

Consider these features, then buy as your judgment dictates.

The Halladay directly suspends the car on four sensitive springs of sufficient **capacity** to absorb all the jolts and jars and prevent rebound.

The Halladay Springs are the famous "Bee Hive" type, the longest lived and most resilient spring made.

The Halladay has no frictional bearings to interfere with the Spring action and cannot bend or break the leaf Spring.

The Halladay has no light, breakable parts or parts to be lost.

Sold strictly upon its merits and positively guaranteed to give satisfaction.

*Write for all the particulars*

Price per set. . . . . \$15.00

**L. P. HALLADAY COMPANY**

Manufacturers of Bumpers, Shock Absorbers  
and Automobile Accessories

520-530 Monroe Street

Streator, Illinois

# Hauls Heaviest Loads

Time is money with a motor truck. Safeguard against delays, with POWERSTEEL TRUCKLINE. Made of famous Yellow Strand Wire Rope, it's absolutely dependable. Attaches instantly, securely. Retails, east of Rockies, at \$11.30 with plain hooks; \$12.75 with Snaffle Hooks.

PASLINE AUTOWLINE, is a smaller edition, for use on passenger cars. Has patented Snaffle Hooks. At dealers, \$5.80 east of Rockies.

POWERSTEEL AUTOWLOCK, a safeguard against stealing of car or spare tire, has strong lock that can't be picked. At dealers, \$2.35 east of Rockies.

DEALERS: Send for particulars of our Money-Making Proposition.

BRODERICK & BASCOM ROPE COMPANY

SAINT LOUIS

NEW YORK

Manufacturers of Celebrated Yellow Strand Wire Rope—Helped in building Panama Canal

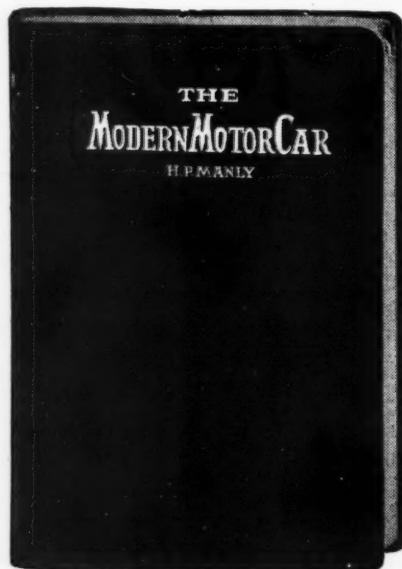
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## POWERSTEEL TRUCKLINE

# The Modern Motor Car

A Valuable Book for Owners, Repairmen, Drivers, Students and Salesmen

By H. P. MANLY



A non-technical book on upkeep and repairs. It covers the design, construction, care and adjustment of cars, and treats exhaustively of the mechanics of the motor car including everything from the single to the eight cylinder. Over 400 different troubles are outlined and their repair carefully explained.

### SYNOPSIS OF CONTENTS

(Chap. I. Parts of the Car—Their Construction, Use, Care and Repair.) Contains simple rules for performing every mechanical operation the car can ever need. Not only covers the newest developments, such as eight-cylinder engines, vacuum fuel feed, etc., but contemplated improvements from the makers of cars and parts.

(Chap. II. Materials and Supplies.) How to Use, Buy or Make Everything Needed in Running the Car.

(Chap. III. Electricity.) Its Underlying Principles Interestingly Explained.

(Chap. IV. Electric Lighting, Engine Starting and Control.) First Complete Explanation. Covers such things as electric gear shift, electric brake, Edison storage battery, new magnetos and new time saving methods of wiring.

(Chap. V. Ignition Parts.) Designs, Construction, Care and Repair of Every Standard Form of Ignition Appliance as Well as Newest Adaptations.

(Index, 24 Pages.) Listing 1165 Headings Under Every Possible Classification.

512 Pages, 5x8 Inches, 217 Figures, Flexible. \$2.00 Postpaid

U. P. C. BOOK COMPANY, Inc.

243-249 West 39th Street, New York



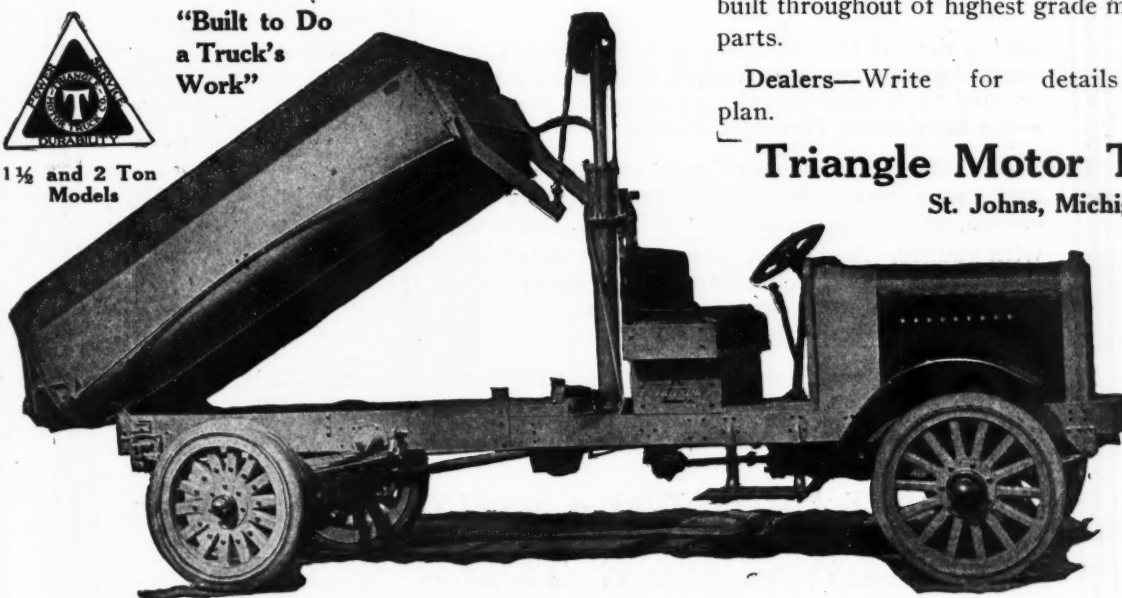
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# TRIANGLE TRUCKS



**"Built to Do  
a Truck's  
Work"**

## 1 1/2 and 2 Ton Models



In practically every field of commercial hauling TRIANGLE Trucks are proving satisfactory and profitable investments. They are built strong and sturdy for the tough jobs—every unit used in their construction is known and accepted in the motor truck industry.

TRIANGLES are quality products. They are built throughout of highest grade materials and parts.

**Dealers—Write** for details of our selling plan.

## Triangle Motor Truck Co.

## St. Johns, Michigan

**Eastern  
Representatives:  
Triangle Motor  
Company,  
381 Fourth  
Avenue,  
New York City**

**New England  
Distributors:  
Eugene F. Lally  
& Sons Company  
Boston, Mass.**



## The Shock Absorbing Acme Bumper Protects the Car Without Damage to Itself

**G** LANCING side blows—head on shocks, are all parried by the Acme Bumper.

It so absorbs the blows that it not only protects the car but does this without any damage to itself. You'll never find an Acme bent or twisted out of shape.

For  $3\frac{1}{2}$  inches back of the protecting front channel bar is a straight bar, between these are five strong coil springs that diffuse the shock—taking it up before it reaches the car. From

this strong spring cushion run arms of steel back to the frame—clamped on with a bulldog grip.

Rubber inside the springs insures against any rattle.

The Acme Bumper is made of high carbon steel—finished in nickel and black. It fits any car and goes on either front or back of car.

Write your jobber for Acme Bumpers—it pays you a profit that makes selling it worth while. Write today—now.

*Jobbers—Get our liberal trade proposition, also write for a sample bumper.*

### Clevenger Engineering and Sales Co.

86 McKinley Place, Ridgewood, N. J.

## Most Durable and Efficient Timer Made



### That's Why It Sells So Easily

Due to the fact that so much ignition trouble originates in the timer, experienced Ford owners have learned to demand a real instrument of precision—the Milwaukee Timer for Fords.

This timer is almost wear-proof and as precisely made as a speedometer. All wearing parts machined, hardened, ground and polished, and fitted with gauges. Assembled timer rigidly tested and inspected both mechanically and electrically. Roller always bears squarely on contacts, insuring a hot, perfectly timed spark.

Interchangeable with stock timer. Also fits Fordson tractor. Retail price \$2.00.

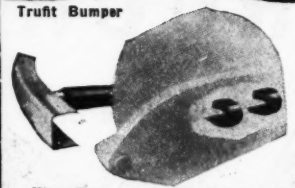
Over 500,000 already sold. Send for our proposition. It will interest you. Catalog free.

**MILWAUKEE AUTO ENGINE & SUPPLY CO., Milwaukee, Wis.**

DEPT. 607

### MILWAUKEE TIMER for FORDS

Truitt Bumper



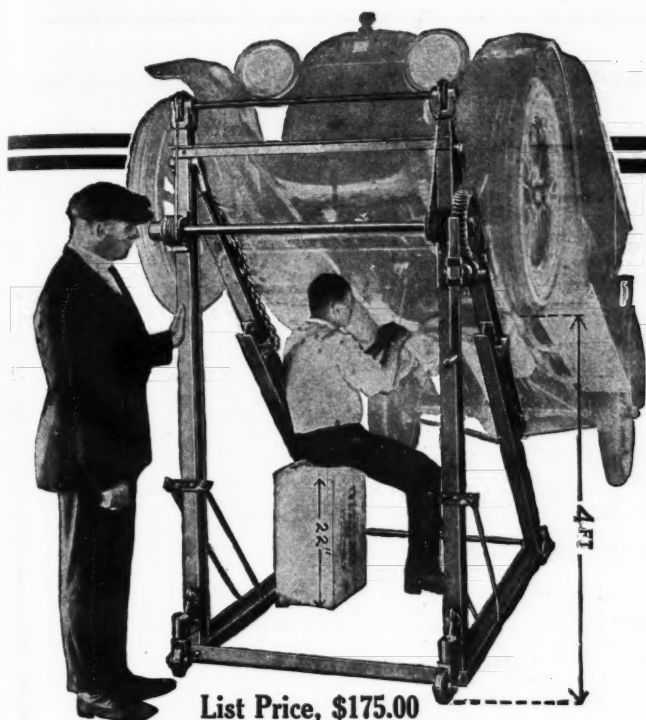
Fits Essex and '19 Buick, also large percentage of all other cars. Strongest and best clamps ever designed—hold under all conditions. A big seller.

Waukee Bumper



One piece bracket. Simple method of attachment. All working parts machined and accurately fitted. Fits great many cars. Send for catalog and dealer proposition.

## A 1-Man device that will stand a car on its end



List Price, \$175.00

# KLEMME

**ONE MAN  
AUTO HOIST AND CRANE**

Speed up your repair work—permit your mechanics to work in cleaner conditions and more comfortable positions—with plenty of light—by using this simple, strong, safe and fool-proof device.

One man easily raises either end of a motor car or truck and a safety locking device locks it at any desired height. It is scientifically constructed and is tested to a strain of 13,000 pounds.

With 50% of your repair work underneath the motor, the KLEMME Auto Hoist and Crane soon pays for itself. The mechanic sits upright where he can work easily, rapidly, ef-

ficiently. Tools are always within easy reach—the right wrench always at hand—and there is plenty of light just where he needs it.

Easy rolling rollers make an easy job of moving it in the garage or on the street.

The Crane attachment comes complete with every outfit and may be attached or detached in a few seconds. It is practical and serviceable—it is particularly adapted for lifting out motors, transmissions, etc.

For further information and prices on this time-saving, labor-saving, and money-saving hoist and crane, write,

*Sales Department*

**THE BAILEY-DRAKE COMPANY, INC.**  
1120 S. Michigan Avenue CHICAGO, ILL.



Complete with Rings  
and Pin

## Cochran Ford Pistons

Complete with RINGS and PIN

*Increases Mileage 25%*

Furnished in Standard Size.

Also the following Oversize:

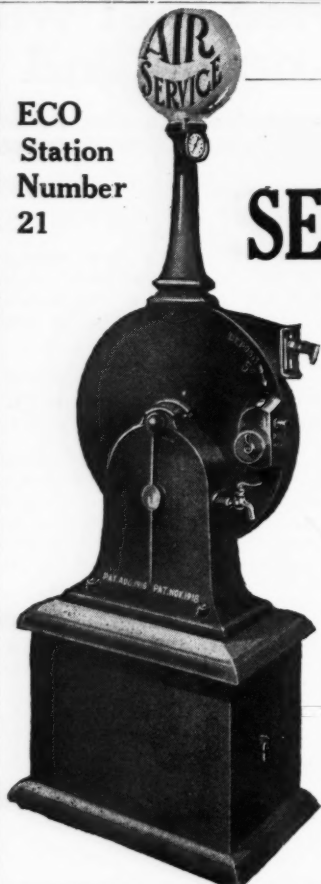
.0025 .005 .010 .015 .020 .025 .03125 .045

*Prompt Delivery—Price \$2.50*

**DETROIT METAL PRODUCTS CO.**  
DETROIT, MICHIGAN



ECO  
Station  
Number  
21



## Patrons Prefer the SERVICE of the **ECO** to the Cheapness of "Free Air"

It has been definitely proven in the last three years—but more particularly in the last year—that motorists in search of air for their tires prefer the service of the ECO to the cheapness of "Free Air."

### A Coin in the Slot for Air Satisfies Everyone and Makes Your Service Pay

Almost every day letters come to us from ECO users whose profits have been materially increased over a period of months by their ECO station. Such letters are at your disposal if you want to see them—but they can all be summed up in a few words as follows:

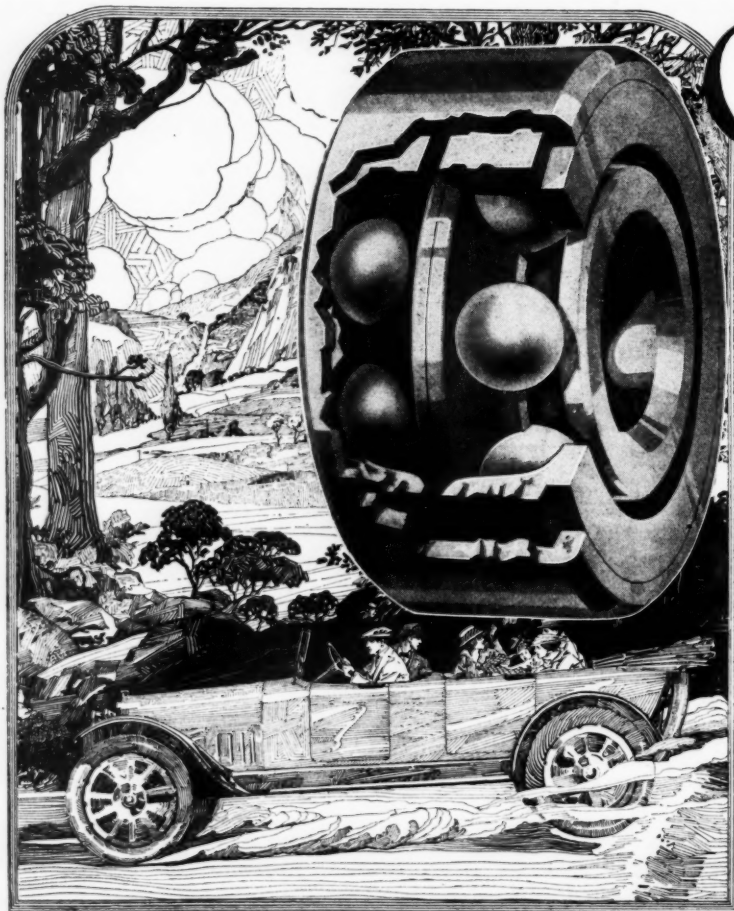
ECO Prepayment Automatic Air Stations pay for the upkeep of your air service, increase your business in other departments, bring you new customers, hold the old ones, satisfy everyone, and show a liberal profit on your investment. ECO Stations pay.

Ask your jobber about ECO. If he can't serve you send us his name and write direct.

**WESTERN MANUFACTURING CO.**

Oskaloosa

Iowa



# Quality

**COMFORT - SAFETY  
ENDURANCE**

**N**EW DEPARTURE Ball Bearings increase the enjoyment of the driver and passengers of a motor car.

No adjustments are possible or necessary.

Chrome alloy steels give New Departures a resilience that absorbs all stresses and shocks without endangering the proper functioning of the bearings.

New Departures are practically frictionless and outwear the car itself.

Engineering practice in America has established New Departures as an essential in the best motor cars.

THE NEW DEPARTURE MFG. COMPANY,  
450a Bristol, Conn.

**New Departure  
Ball Bearings**





## CASH in on the Replacement Business

Keep a supply of Standard Radiators in stock and you will make quick turnover and liberal profits. These radiators will sell themselves if shown. Get at least one of them at once.

These high grade honeycomb  $2\frac{1}{2}$  in. brass radiators are interchangeable with the regular Ford and fits the Ford Shell. Each one is tested to 10 pounds air pressure.

Made of standard radiator brass all hand soldered and perfect in every way.

The retail price for a Standard Radiator without shell is \$19.50. Complete \$21.00. Let us send you a shipment C. O. D. with the 5 day return privilege clause. If it isn't the best radiator for Fords you ever saw. We have never had one returned, so we're safe in making this offer.

Sold direct if dealer does not handle.

Radiator cores are complete for all cars. Write your needs.

There is a good dealers' discount. Write for it today.

# Standard Radiator Company, Inc.

Springville, New York

## Don't be Bothered with Bugs and Insects when Driving

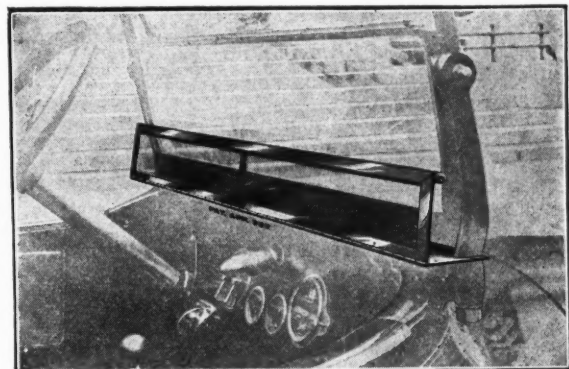
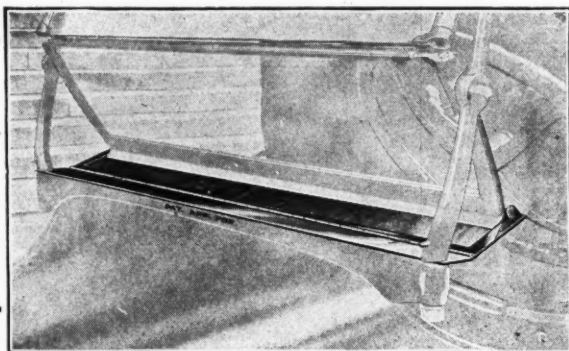


Attach a "Mac" Comfort Screen (Patented) to your windshield. Filters the air, cools and ventilates the car when driving. Opens and closes in an instant. Not only keeps out bugs and insects but dust as well. Simply built. Non-rustable. No intricate parts to cause trouble. A good looking accessory.

### The "MAC" COMFORT SCREEN

Protects the instrument board from rain. Will not rattle or rust. Attached in ten minutes without disfiguring your car. Wrench only tool necessary. Satisfied users everywhere endorse it and so will you after trying it out. It means comfort and convenience when driving your car. Immediate deliveries made for Buick models D, E, H, and K, Dodge, and Oakland 1919-1920 models. Give frame number when ordering for Dodge. Orders for the "Mac" Comfort Screen for other makes of cars are solicited. Ask your dealer or write us direct for booklets.

PRICE COMPLETE \$10.00 F. O. B. FACTORY



SOLD BY

**"MAC" COMFORT SCREEN CO. Box 513 Louisville, Ky.**

MANUFACTURED BY THE HIGGINS MFG. COMPANY, NEWPORT, KY.

## The Most Remarkable Automobile Top Material

LIGHT IN WEIGHT—DEPENDABLE  
IN QUALITY — NON CRACKING —  
NON BLISTERING—Dridek is Made to  
Satisfy.

Send to Dept. C for Samples and Prices

**L. J. MUTTY COMPANY**  
BOSTON, MASS.



## THE K & S UNIVERSAL ENGINE STAND

IT MAKES ENGINE HANDLING  
EASILY AND QUICKLY  
ACCOMPLISHED

In This Posi-  
tion Remove or  
Assemble Con-  
necting Rods  
and Pistons



With this stand the motor can be turned in its different positions for crank and cam shaft fitting, removing or assembling connecting rods and pistons, assembling crank case, etc. Only one clamping screw

is necessary for making attachment. The illustrations show the sturdy simplicity of this portable stand. Its first trial in your work room will prove its value in a practical, money-saving way.

*The price of the K & S Universal Engine Stand is \$35. It will pay for itself many times over in time and labor saving.*

*Ask us more about it*

**Water Street Garage & Machine Company**  
South Brownsville, Pa.



Every Overhauling Operation Completed Without Removing Engine from Stand

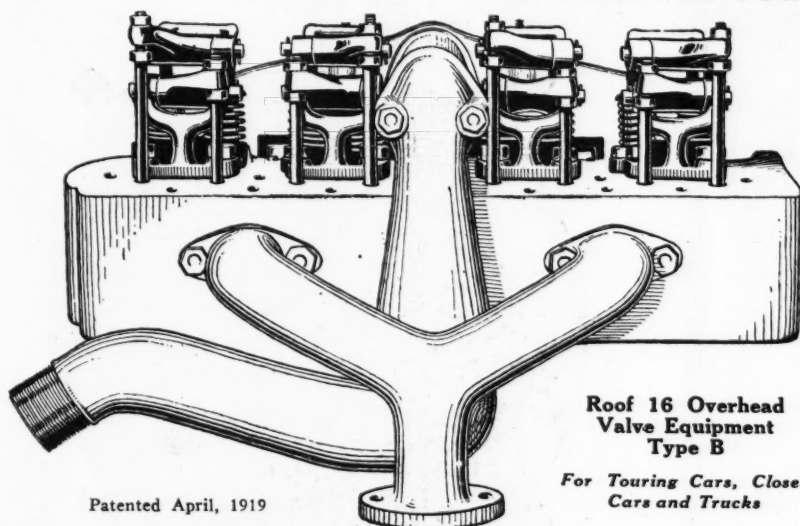


Position For Assembling Crank-Case



# POWER and SPEED Roof 16 Overhead Valve Equipment

FOR FORD MOTORS



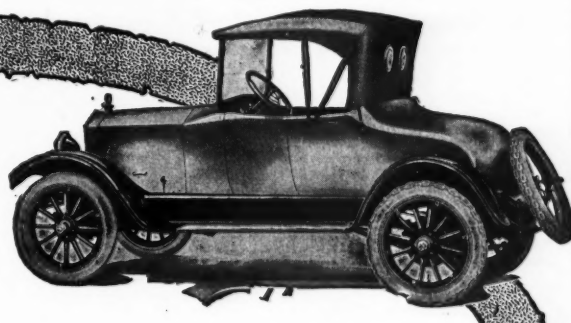
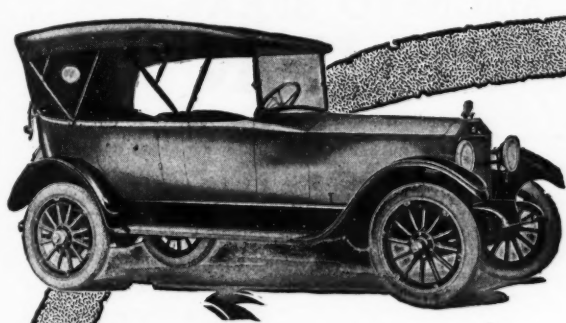
Patented April, 1919

**Roof 16 Overhead  
Valve Equipment  
Type B**

*For Touring Cars, Closed  
Cars and Trucks*

Comparison Brake Horse Power Tests at the United States Bureau of Standards gave Standard Ford motor with regulation carburetor 18.7 Horse Power. The same motor with 16 Valve Head and regulation carburetor 22.4 Horse Power. The same motor with 16 Valve Head and **Special** carburetor 29.7 Horse Power. Recent tests at U. S. Bureau of Standards gave 32 Horse Power. We are Manufacturers and Distributors of speed and other specialties for Ford cars; 3 to 1 gears, high speed camshafts, aluminite, light grey iron pistons, lynite pistons, aluminite connecting-rods, racing spark plugs,

racing carburetors, roller bearings, counterbalances, wire wheels, multiple speed transmission, high tension magnetos, special oiling system, special worm and gear, steering gear, racing tires, racing bodies, hood and radiator, parts for underslinging chassis. Tell us what you want. We can supply it. Racing quality. Lowest prices. Send for our Complete Literature on how to build fast cars and double the value of your converted Ford Truck and descriptive circular on Speed and other Specialties for Fords.

**LAUREL MOTORS CORPORATION****Anderson, Indiana, U. S. A.**

## Dixie Service

Service is easier to pronounce than to perform.

But the permanent success of any dealer depends almost entirely upon his ability to offer service—service both in car performance and factory cooperation.

The good reputation of the Dixie Flyer is founded very largely upon its invariable

satisfactory performance under all conditions and the generous cooperation of the forty-year-old company back of it in helping the dealer to attain a permanent footing high in the scale of successful selling.

We welcome inquiries from live dealers everywhere who appreciate this brand of "dealer help."

KENTUCKY WAGON MFG. CO., INCORPORATED, THIRD AND G STREETS, LOUISVILLE, KENTUCKY

The **DIXIE** Flyer

The **DIXIE** Flyer

# Save

**TIRES LIKE THESE**



**I Earned \$2200 In Four Months**

This is Richard A. Oldham. Mr. Oldham was telegraph operator for the Illinois Central Railroad for twenty years. He is fifty-eight years old. One day he read one of my advertisements and the possibilities of making money in the Auto Tire Surgery Business. In a few weeks he had purchased and installed a Haywood outfit. A short time afterward he wrote us that his income in four months was as much as it had been in 2½ years as telegraph operator.

## Be a Tire Surgeon

**MAKE \$2,500 TO \$4,000 PER YEAR GIVING NEW LIFE TO OLD TIRES**

It is being done—by the wonderful new Haywood method of Tire Surgery. It is one of the great results of the war. A Haywood Tire Surgeon can do more with old tires than was even dreamed of before the war. By the Haywood Method a Haywood

Tire Surgeon can give 4,000 to 5,000 more miles of new life to a tire, that two years ago would have been thrown on the junk pile. As a surgeon saves human lives by his operations, so by Haywood Tire Surgery, you can save and lengthen the life of old tires. And it's easy to learn.

## HAYWOOD'S TIRE SURGERY

### Stations Are Needed Everywhere

20,000,000 tires wearing down every day. By Tire Surgery, you can quickly repair, rebuild and give new life to tires seemingly all worn out. Cuts, gashes, tears, bruises, broken fabrics, every kind of an accident that can happen to any tire, inside or out, you can repair and save for long service. The chance to make money is simply wonderful.

**\$2,500 to \$4,000 A YEAR is possible**

During the war the nation needed an unusual service to keep the thousands of automobiles, ambulances and aeroplanes going day and night. Haywood Tire Surgery met the demand.

If we told you all the truth you wouldn't believe it. You would say, "It is too good to be true." But you can see what a great field there is for Haywood Tire Surgery Stations—for this better way. You have eyes. You see why there must be wonderful chances to make money. But to see—to know is not enough.

It is action—decision—that counts in these days. The man who waits, gets lost in the shuffle. It is the resolute will to follow your hunch that lands you where the money is.

### Send Today for My Free Book

I have ready to mail you the day I get your request, a fascinating book—all about tires—how to repair them by the Haywood Method—how to start in business—how to build up trade—what to charge. "You needn't write a letter—just tear out the coupon right now, fill it in and mail. In 48 to 72 hours you can have the whole proposition right in front of you. It's a case of walking right into \$2500 to \$4000 a year and up. Use coupon at the left.

**M. HAYWOOD, President**

**Haywood Tire & Equipment Co.**

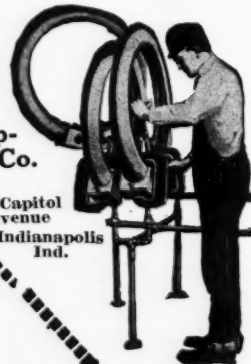
**WRITE TODAY**

**M. HAYWOOD, President**  
Haywood Tire & Equipment Co.  
500 Capitol Ave., Indianapolis, Ind.

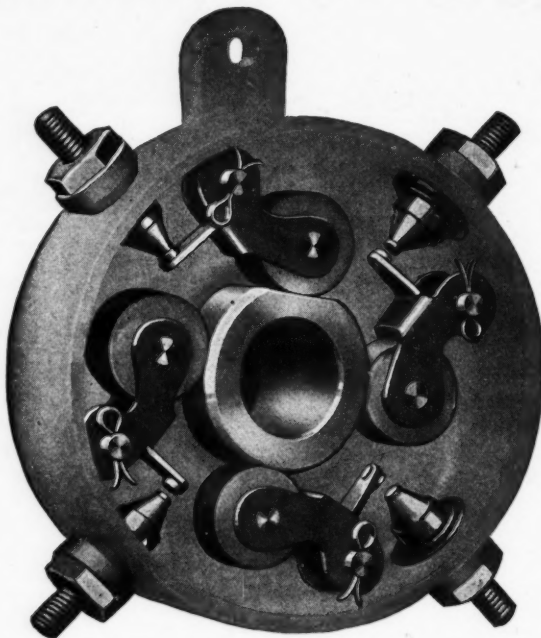
DEAR SIR: Please send me by return mail your free book on the new Haywood Tire Surgery Method and the details of your free school of tire repairing.

Name .....  
Address .....

500 Capitol Avenue  
Indianapolis Ind.



## An Ad That Is Written by the Users



## Of the DUNTLEY MAGNETO BREAK TIMER

Performance counts. Here are a few excerpts, picked at random from thousands of letters attesting the excellent performance of the Duntley. The users' statements are unbiased—read them—then judge for yourself.

**"Works so much better than I expected."**

"I have lived here for 29 years and have a \$10,000 Mail contract, and I carry the mail in a Ford car and it took a timer every 15 or 20 days until I bought your Duntley Magneto Break Timer. I have a daily trip of 50 miles and heavy mails. The country is hilly and full of dust. Your timer works so much better than I ever expected. I enclose money order for four more, as I have orders for that many from friends who have seen what your timer has done for me.

**WILLIAM CRIDER.**

Bickelton, Washington, July 12, 1919.

**"Fulfills every claim."**

"Used a Fordson Tractor for 12 months with perfect satisfaction, except the timer, having bought six timers during the year. After beginning to use your timer, we do not know what trouble is. The Duntley absolutely fulfills every claim you make for it. Have used it about six weeks and the tractor has worked like a different machine. Has much more power. Goes almost as fast in intermediate as it did before in high. Would not take five times what we paid for the Duntley."

**R. W. BARR & SON.**

Grassland Stock Farm, Route 4, Gallatin, Tenn.

**"I turn her over once and away I go."**

"I used to have to crank my head off but I put the Duntley Timer on my Ford and now I turn 'er over once and away I go."

**H. WILSON.**

Aurora, Ill., July 14, '19.

**"Forget all about the old trouble."**

"In regard to the Duntley Timer, I have driven the car about 2,000 miles since I put it on and have forgotten all about the old trouble that I used to have. The snappy contact is easily noticeable, and naturally it gives the motor much more flexibility. There is no other timer for me."

**W. C. STOFFER.**

La Porte, Ind., July 14, 1919.

**"I recommend it to anyone who wants a timer worth the money."**

"I have used the Duntley Timer you sent me, and it simply is a marvel. I am glad I bought it. You could not have it back for ten times the price I paid for it, and I recommend it to anyone wanting a timer worth the money. I am a rural mail carrier, and have given it a test over a thirty-mile route every day from the time I bought it from you. I am proud to own it."

**JOHN A. ENDRIS.**

R. L. C. No. 4, Pana, Ill., July 5, 1919.

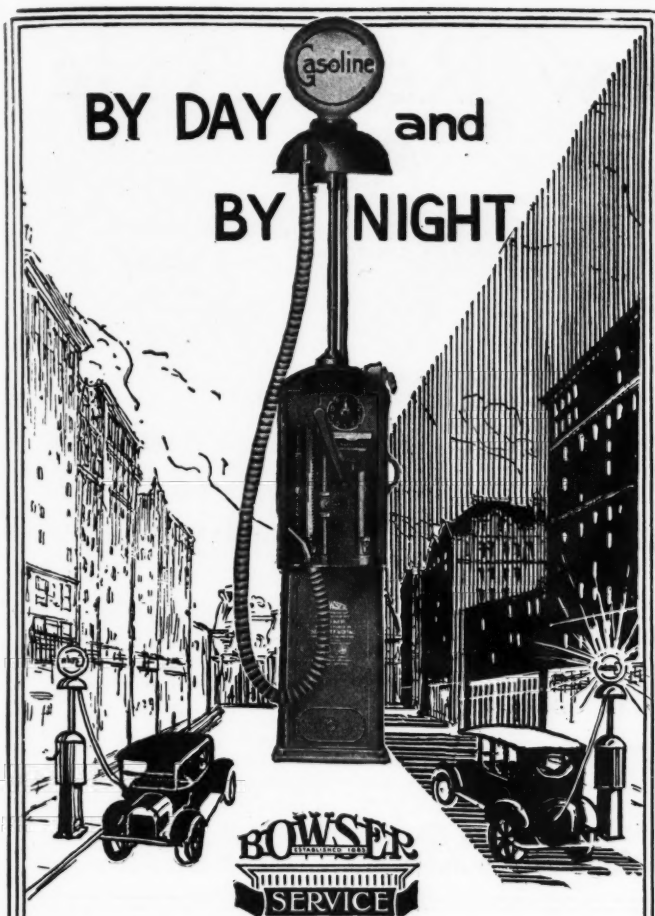
Sold on an absolute money back guarantee. Write today for all the details.

**J. W. DUNTLEY**

1004 Michigan Ave.

**CHICAGO**





### Day and Night—Year In and Year Out

You will find Bowser Gasoline and Lubricating Oil Pumps, serving the motorist everywhere.

From coast to coast, from the northern pines to the southern Gulf, motorists look for Bowser Stored Gasoline and Oils.

Dealers everywhere enjoy the convenience, safety and saving afforded by Bowser underground storage tanks and self-measuring pumps.

## Bowser Outfits Give Years of Continuous Service

with no up-keep cost. They store gasoline and oils with safety and without loss.

You will have a Bowser some day, so Why Not Now and get your share of the business in your community.

*Send your name and address for literature,  
It will pay you.*

**S. F. BOWSER & CO., Inc.**  
**Fort Wayne, Indiana, U. S. A.**

**Canadian Office and Factory, TORONTO, ONT.**

LONDON  
32 Victoria St. S. W. 1

HAVANA  
Lonja del Comercio 427

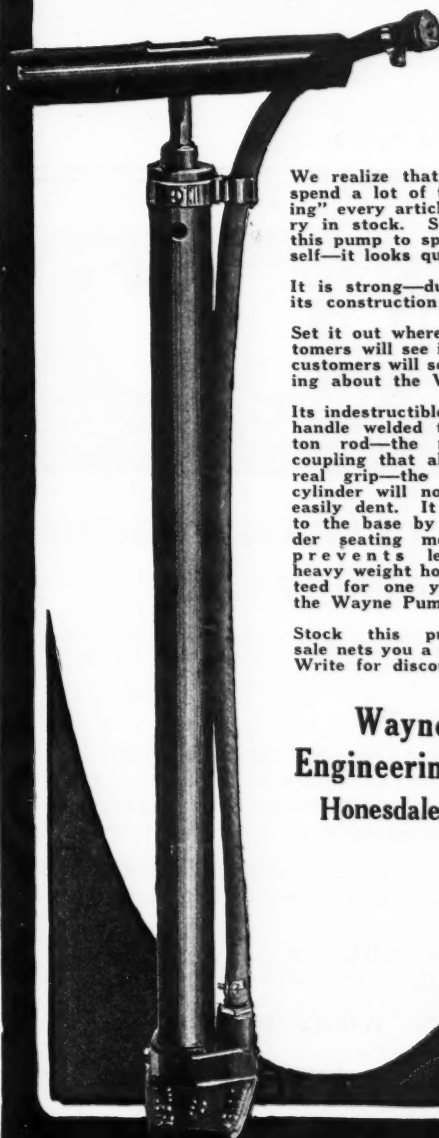
PARIS  
5 Rue Denie-Poisson  
SYDNEY  
6 Castlereagh St.

# Strength



## WAYNE TYPE "B"

Hand Pump Sells Easier



We realize that you can't spend a lot of time "talking" every article you carry in stock. So we built this pump to speak for itself—it looks quality.

It is strong—durable, and its construction is simple.

Set it out where your customers will see it and your customers will soon be asking about the Wayne.

Its indestructible steel tube handle welded to the piston rod—the man's size coupling that allows for a real grip—the steel tube cylinder will not rust nor easily dent. It is secured to the base by the shoulder seating method that prevents leakage—the heavy weight hose, guaranteed for one year, makes the Wayne Pump supreme.

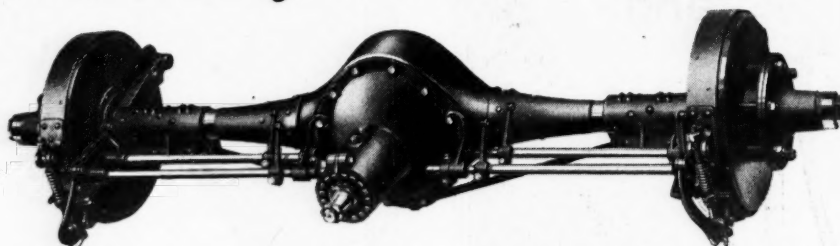
Stock this pump—every sale nets you a good profit. Write for discounts.

**Wayne  
Engineering Co.**  
**Honesdale, Pa.**



# The Salisbury New Rear Axle

Pressed  
Steel



Standard  
Type

"An Automobile is only as good as its Rear Axle"

**Y**OU may have the best engine in the world in your car but that does not and cannot make it a *good motor car* unless the *rear axle* is mechanically correct and physically perfect.

The superiority of the Salisbury New Rear Axle is due to the fact that its mechanism is compact, silent and combines the great strength of our own special formulae steel with simplicity of design and construction.

The reason that the Salisbury New Rear Axle transmits the power of the engine to the driving wheels with the least possible friction or loss of power is because more than 150 of its parts are carefully machined and fitted to micrometer measure.



Established 1902

Made in two standard sizes for cars weighing from 2600 to 4000 pounds  
The automobile manufacturer who specifies our axles adds a strong selling point to the prospective purchaser

## Salisbury Axle Company

Jamestown, New York, U. S. A.



## Beauty of Glass a Factor in Selling Cars

Manufacturers of automobiles realize the value of beauty as a sales factor. Consequently they demand glass of high quality—at a reasonable price.

**Crystal Sheet Glass**, while considerably less expensive than plate, possesses every element of beauty and quality essential to high grade automobile construction.

It is strong, uniform in thickness, perfectly transparent, and of the proper degree of flexibility.

Ask us to explain in detail why **Crystal Sheet** is the logical glass for your cars.

**AMERICAN WINDOW GLASS CO.**

*World's Largest Producer*

GENERAL OFFICES: FARMERS BANK BUILDING  
Pittsburgh, Pa., U. S. A.

## Big Fall Profits In BATTERY CHARGING

Think of the thousands of cars that will soon be stored for winter with batteries to be charged and kept in condition! Figure how much greater the demand for battery charging service will be than ever before. Consider the **PROFITS** that battery charging this fall will bring to the garage owner who is prepared to meet this demand. Then ask yourself: "Can I really afford NOT to buy a battery charging outfit?" We leave the answer to you.

**Battery Charging Will Pay \$100 to \$250 Clear Profit Every Month**

With HB equipment, battery charging will be your **biggest money-maker**. The demand for good, reliable HB charging service is universal. It costs only 10c to 15c each to charge batteries—customer pays 75c to \$1.50—at least 400% clear profit. HB Chargers require practically no attention, have no delicate parts to break,

no burn-outs or expensive renewals, and any mechanic can handle the business in a few minutes time each day.

**Only \$15 Puts This HB 500 Watt Charger in Your Garage—Earnings Pay the Balance**

Easy monthly payments. Charges 1 to 8 6-volt batteries at one time. Restores batteries to perfect condition. Battery charging customers soon bring you all their garage work. Ten days' trial under HB Absolutely Money-Back Guarantee. Pin this ad to your letterhead and mail TODAY for full information. Ask also about HB Ball Bearing Motors and Generators.

**HOBART BROTHERS CO.**

Box A 91

Troy, Ohio

*Successful Manufacturers since 1893.*





**Self  
Fluxing**

## Soldering Jobs made Easy

—with a self-fluxing solder.

## Kester Acid-Core Wire Solder

has a core made up of little pockets full of flux. As solder is melted off, flux flows out with every drop of solder, and automatically takes care of the fluxing. It is handy when soldering in tight places, on automobile repairing. It makes soldering easy even for the inexperienced solderer. Costs little more than the ordinary solder. Try it out on your next job.

Ask your dealer for it or write for free sample.

It is sold in cartons containing one pound coils and on one, five and ten pound spools.

Pacific Coast  
Distributors  
Sierra Electric Co.  
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CHICAGO  
SOLDER CO  
MFRS.

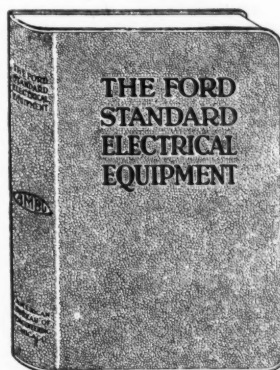
218 N. Union Ave.  
CHICAGO



## Count the New Fords Passing Your Shop

Every one of them is a possible customer if you know how to repair their new starting and lighting systems. But you haven't time to go to the factory for instructions. Then get the book that tells all about the new F. A. system—it is complete—easy to understand and full of illustrations.

## The Ford Standard Electrical Equipment



This book is prepared by practical automobile and electrical men for automobile repairmen. It shows how to locate any trouble.

If first describes the construction. It tells of every wire, of every screw, of every connection and what it is for.

It traces every circuit complete. It shows every connection with the motor, generator and battery. In other words, it tells all about the electrical connections for starting, lighting and ignition.

## Make Money—Save Time

When a Ford owner has any electrical trouble, you should be prepared to locate it in a few minutes and make the repairs in the quickest possible time. In this way you can make money, save time, and satisfy your customers.

The only way to be fully prepared without going to the factory for instructions is to have a copy of this splendid book. With it you can keep abreast and possibly ahead of your competitors in this kind of repair work.

## Introductory Offer

This valuable book is brand new—right off the press. There are 150 interesting pages, 47 illustrations and diagrams, and handsomely bound. We are making a special offer of \$2.50 for the first edition. If you wish to take advantage of this special offer, you should send your order today. This is your opportunity.

## Mail the Coupon To-day

Write your name and address on the coupon below, enclose check or money order for \$2.50, mail to us, and we will mail you this book—the "Ford Standard Electrical Equipment."

Examine and consult it for five days and if you are not satisfied we will return your money.

### AMERICAN BUREAU OF ENGINEERING

Makers of the Famous AMBU Trouble Shooter

1605 Michigan Ave.

Chicago, Ill.

Please send me your book, "The Ford Standard Electrical Equipment." If I am not satisfied after I have consulted it for five days, you are to return my money.

Name .....

Address .....



## May we send you this guide of Buffalo and Niagara Falls?

**A**N illustrated guide to points of interest in and around Buffalo and Niagara Falls. Free on request.

When in Buffalo, stop at the Hotel Lenox—Buffalo's ideal hotel for motorists. Quietly situated, yet convenient to theater, shopping and business districts and Niagara Falls Boulevard. First-class garage.

European plan. Fire-proof, modern. Unusual cuisine. Every room an outside room.

\$2.00 up.

On Empire Tours, Road map and running directions free.

**C. A. MINER**

Managing Director,  
North St. at Delaware  
Av., Buffalo, N. Y.



# HOTEL LENOX

## A NEW RADIATOR

which embodies all the good features of the old types and which has new points of superiority made into it by the best tools and equipment in use today is now on the market.

**A FLAT STREAM OF WATER vs. A ROUND STREAM**  
The Martin Radiator is of the **FLAT** tubular type. That is the water spaces are flat. The stream of water is thin and is cooled rapidly by the air.



### RADIATOR REPAIR MEN

Here is the radiator to install. Easiest repaired because of edges being on outside and perfect spacing of passages. It will bring business back to you.

### MANUFACTURERS

Send blue prints and specifications for our estimate. We have large facilities and can figure on your whole requirements.

### WRITE FOR A SAMPLE

and prices. This radiator is so good we want you to examine a section. Send 25c for postage.

**Martin Metal Mfg. Co.**

WICHITA, KANSAS



## "Just What I Want"

Everyone says so at a glance, and when once installed in your Garage or Shop you would as soon think of keeping your front doors perpetually locked as doing without an

## Automatic Extension Reel

*For Electric Lamps*

Take your lamp to any part of your Garage or Shop, locking and unlocking at any desired point. Automatically rewinds the cord when you are through with the light.

**STRONG AND DURABLE.** Send for full particulars and prices. Remember that it is not in any way a "half-baked" proposition nor an amateur outfit, but a splendidly constructed and practical piece of mechanism for men who haven't got time to bother with nonsensical makeshifts. Equipped with 25 feet packinghouse cord, handle, socket and lamp guard.

APPROVED BY THE UNDERWRITERS

**The Cincinnati Specialty Manufacturing Company**  
INCORPORATED

*Sole Manufacturers and Owners of Patents*

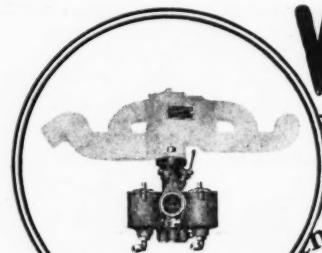
1913 Powers Street, CINCINNATI, OHIO

BRANCH OFFICES:

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39-41 Cortlandt Street, New York

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**WESTERN**  
DUAL FUEL CARBURETOR



### Dealers—

The only logical way to reduce fuel expense is to use a cheaper fuel—Kerosene—and to use Kerosene successfully it is essential that the right carburetor be used—the WESTERN. Since the introduction of the WESTERN carburetor, Dealers have found the accessory that is paying them the profits they are losing by not getting cars.

*Write for Illustrated Literature.*

**Western Carburetor Co.**  
Alma, Michigan

Designed  
to use  
any  
fuel



# WELEVER ANTI-OIL-LEAK PISTON RING



Here is a piston ring guaranteed to be absolutely oil proof, thereby preventing spark plug fouling and carbon formation.

A knife edge lip with groove for gathering oil and outlet passage at bottom of ring allow excess oil to flow back into crankcase through holes drilled in piston ring groove for that purpose. This results in a saving of oil from 40 to 50% as well as a saving in fuel, because of perfect oil control.

Write for circular giving full particulars, prices, testimonials, etc.

THE WELEVER PISTON RING CO., Inc.  
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## ATSCO

### PORTABLE AIR TANK

#### Emergency Jobs Call For Quick Action

The ATSCO should be part of your standard equipment on the Emergency car. It has a working pressure of 250 pounds per square inch. It is strong, light and easy to handle and will stand up under rough treatment. Comes complete ready to use. Price \$24.50 f. o. b. Pittsburgh.

Manufactured only by

#### Air-Tight Steel Tank Co.

Main Office  
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Pa.

Tank makers for nearly 30 years. We manufacture a line of gas-line storage tanks & pumps and a general line of pressure tanks for all purposes.



### Send Us Your SCORED CYLINDERS

and cracked water jackets. Our factory nearest you will make these repairs on a 24-hour service basis. Regrinding of cylinders that have been scored by wrist pins or through other causes is unnecessary. The Lawrence Patent Process fuses a silver-nickel alloy into the defects making a quick, clean, permanent job without altering the bore of the cylinder. Same piston and rings fit.

Cracked water jackets are also made permanently good through this same process.

A list of our factories is given below. There is one near you. Send the scored cylinders and cracked water jackets to the nearest plant. There we will insure you quick service and perfect results. Aside from the liberal arrangements we make with you, the money saving service you render your customers will help make you known as a concern that looks after their interests—and this is a business asset in itself.

Write to any of our factories for full information.

L. LAWRENCE & CO. Woolworth Bldg.  
New York

#### PLANTS

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Chicago, 1522 Michigan Ave. Newark, N. J., 292 Halsey St.  
Cleveland, 6259 Euclid Ave. N. Y. C., 791-3 Eleventh Ave.  
Detroit, 1246 Jefferson Ave. Philadelphia, 1601 Summer St.  
Los Angeles, 885 Washington St. Pittsburgh, 5102 Baum Bldg.  
Milwaukee, 18-26 Martin St. San Francisco, 116 Hyde St.

#### LICENSEES

Denver, Blanchett Welding Co., 149 South Broadway.  
Kansas City, Kans., General Auto Parts Co., Grand Ave.  
Lima, O., Buckeye Repair Shop, 133 Water St.  
Memphis, J. B. Cook Machine Shop, 294 Washington St.  
Providence, R. I., Liberty Manufacturing Co., 15 Pine St.

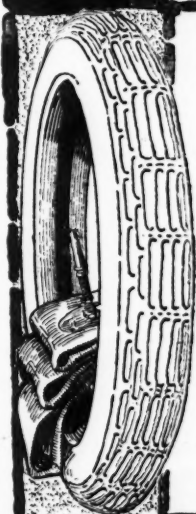
Established 1862

A Few Territories Still Open for Licensees

# LAWRENCE PATENT PROCESS

SCORED CYLINDERS AND SAND-FAULTS CORRECTED TRADE MARK LAWRENCE BORE PRECISION MAINTAINED CYLINDER SCRAPPING ABOLISHED

# TIRES FOR ECONOMY MOTORISTS TUBES



Slightly used and repaired tires and new tubes of the best known standard makes that mean big cash savings for every car owner.

Size	Tires	New Tubes	Size	Tires	New Tubes
30x3	5.00	1.70	34x4	8.75	2.80
30x3 1/2	6.00	2.10	34x4 1/2	9.25	3.15
32x3 1/2	6.50	2.25	35x4 1/2	9.50	3.25
31x4	7.25	2.50	36x4 1/2	9.75	3.30
32x4	8.00	2.60	35x5	10.50	3.65
33x4	8.75	2.70	37x5	11.00	3.75

For Non-skids add 10% to above prices

### COMPLETE STOCK of NEW TIRES

Write for Prices

Terms: \$1.00 deposit with each tire ordered, balance C. O. D. subject to inspection. Specify style of rim to avoid delay. Although at the above prices these tires bear no mileage guarantee, we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

Special Proposition to Live Dealers  
TIRE REPAIR & SUPPLY CO.

Dept. A, 1429 Michigan Ave., Chicago, Ill.  
Phone Calumet 47-48-49

## Service Stations & Garagemen

### Big worth-while profits with astonishing increase of trade

immediately follows your taking on

## NEW YORK REPLACEMENT IGNITION COILS

Unless you are already handling our **REPLACEMENT IGNITION COILS** you cannot realize the tremendous existing demand—they are not in the class of ordinary accessories. They must be procured immediately when coil troubles occur.

Fifteen years' coil building experience enables us to produce a coil that gives a crashing big hot spark, even when battery is low, which insures easy starting, perfect running and full power from present day gas.

No article ever supplied the automobile industry has proven more beneficial alike to Dealer, Jobber and user. We make a coil for every car, that is guaranteed for all time.

Circular showing how to order for each model car with prices and other information upon request.



TYPE A

**NEW YORK COIL COMPANY**  
338-340 Pearl Street, New York, N. Y.

## NEW DOVER

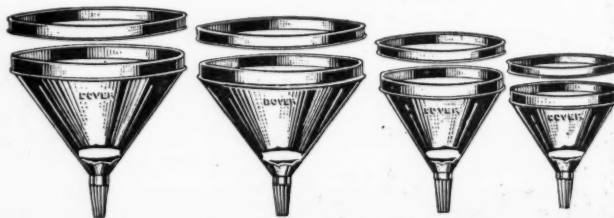
### Two-in-One-Offset Oil Funnel



This funnel nominally has a projecting spout at an angle  $2\frac{1}{4}$  inches long. Another spout is furnished 8 in. long, with an offset of 3 inches. This spout can be attached to either end of the tube on the funnel, which give the advantage of two angles as shown in cut.

**DOVER STAMPING & MFG. CO.**

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## 20,000 Miles Without a Puncture

That is the remarkable report a man sends to us. He used the same air that was pumped into the tube when put on.

### Written Guarantee for 10,000 Miles



**BRITSON PNEUMATIC 10,000-Mile Tires** eliminate all tire troubles because they are—

**PUNCTURE PROOF  
BLOW-OUT PROOF  
SKID PROOF  
RUT PROOF**

**RIM-CUT PROOF  
OIL PROOF  
GASOLINE PROOF  
TROUBLE PROOF**

Run through glass, nails, tin cans, ruts, oil, over slippery streets—it makes no difference.

**BRITSON Tires** are the outcome of ten years of rigid testing. They are proving a revelation in the tire world for the good reason that they solve all tire problems.

#### Enthusiastic Reports

One man says he has run 18 months without a puncture or other tire trouble. Another says he has forgotten what tire trouble is. One writes that he never takes his tires off only to paint his wheels. Still another says that he has no use for chains since using **BRITSON Tires**, which do not skid.

**Can You do this with Your Tires?**

### Try 'Em First—Then Pay!

Has a tire manufacturer ever offered you as much? Neither could we if years of testing had not proven beyond all doubt that **BRITSON 10,000-Mile Tires** are the complete perfection—the final word in tire construction. And we want YOU to try **BRITSON Pneumatic 10,000-Mile Tires at our expense.**

#### FREE TRIAL COUPON

**BRITSON MFG. CO.**  
Dept. 12-99 Omaha, Nebr.

Please send to me by return mail, the details of your **FREE TRIAL OFFER** and complete information about **BRITSON 10,000-Mile Tires.**

Name \_\_\_\_\_  
Street, P. O. Box or R. F. D. \_\_\_\_\_  
Town \_\_\_\_\_ State \_\_\_\_\_  
I use \_\_\_\_\_ tires  
Give Size \_\_\_\_\_

Your inevitable delight and enthusiasm over the results of this trial is our assurance of your satisfaction.

Don't bother about writing a letter. Just clip the coupon at left, fill it in and mail to us **TODAY.** It puts you under no obligation.

**Britson Manufacturing Co.**

1015 to 24 Woodmen of the World Bldg.

Dept. 12-99 Omaha, Nebraska



### PACO—The Distinctive Body

## 1919 Exclusive Points

**PACO BODIES** are back again. They have returned with new features after their withdrawal from sale while all of the nation's steel was being used against the Hun.

Make a snappy, fast and comfortable roadster out of the old Ford by putting on a **PACO BODY.** Modeled after world's greatest speedcars—long, sloping hood—streamline cowl—low seats and receding rear end—**PACO BODIES** offer least wind resistance. Designed on scientific engineering lines for speed and comfort.

#### FREE !!

3-color circular with illustrations from actual photographs of **PACO BODIES** mailed on request.



#### Write TODAY

Send for illustrations and prices of **PACO BODIES.** Do this today—get full description of these classy racing bodies.

**PACO BODIES ARE EXCLUSIVE.** We are patentees, sole owners and sole manufacturers of this type of racing body. All designs are fully covered by U. S. Patents granted Jan. 23rd and March 13th, 1917.

See the 1919 **PACOS** with the new Sport Top and Windshield, **PACO** exhaust, disk wheels and other features. Send for the **FREE Circular.** Order an exclusive—distinctive—**PACO BODY.**

**PACO MFG. COMPANY, Dept. 5, PEORIA, ILL.**

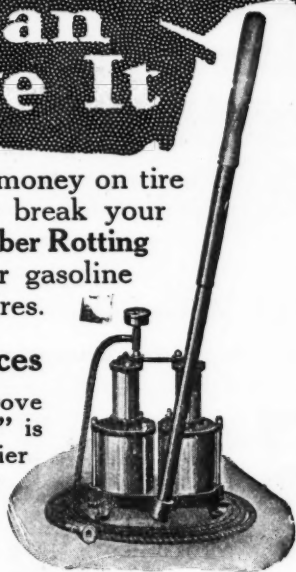


# At Our Risk— You Can Prove It

Don't waste good money on tire pumps that either break your back, or pump Rubber Rotting Oil particles or gasoline fumes into your tires.

## Take No Chances

At our risk you can prove that the "Dead Easy" is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.



Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's "Dead Easy."

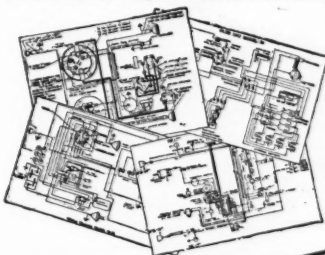
FREE TRIAL OFFER—Write today, NOW, for fifteen day—no-money-in-advance—free trial offer.

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BATTLE CREEK, MICHIGAN, U. S. A.

# 850 WIRING DIAGRAMS

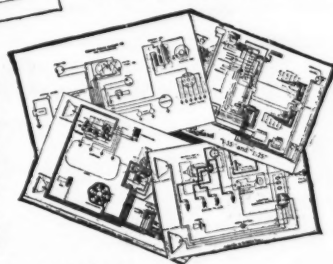
## In New Edition of AUTO ELECTRICIANS GUIDE

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Garages and  
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**We wish to  
ANNOUNCE  
that we now do all  
kinds of expert ar-  
mature rewinding  
QUICK SERVICE.**

# Is Your Tire Pump Complete

Price  
in U. S.



50c.

With a

## SCHRADER UNIVERSAL PUMP CONNECTION

attached to your tire pump you are saved the labor of pumping your tires up beyond the required pressure. It permits the measuring of the inflation without disconnecting the pump and the tire.

**A. SCHRADER'S SON, Inc.**  
785-793 Atlantic Avenue Brooklyn



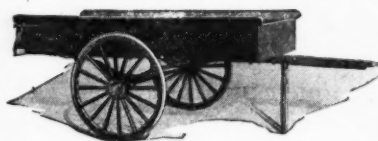
### Repair a Broken Casting in Ten Minutes' Time

**P**ETER'S Metallic Filler melts at 300 deg.—no need to heat the casting to a dangerous temperature. Repairs cracks and breaks in iron, brass and bronze perfectly and permanently. Mends a broken cylinder without removing the engine. Just use an ordinary blowtorch. Price, repairman's package, \$5.50. Consumer's package, \$3.00.

**ALUMINUM BRAZING SOLDER COMPANY**  
260 Montgomery Bldg. Chester, Pa.



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A complete line of trailers at all prices, for all purposes.

An unusually interesting dealers' proposition. Write for catalog and full information.

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*Makers of Springs and Axles for Heavy Duty Service for more than Fifty Years*



**SHELDON AXLE & SPRING CO.**  
WILKES-BARRE : : : : PENNA.

## Steel Castings

Electric or Converter

Capacity, 100 tons daily. Highest quality castings. Prompt service. Unexcelled shipping facilities. Send blue-prints for quotations.

"MASTODON" TRACTOR HOOPS  
will give your Tractor more traction. Write.

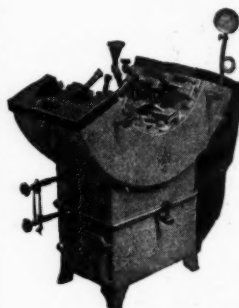
**THE STANDARD STEEL CASTINGS COMPANY**  
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### Stop Worrying About Fire and Explosion! Equip Your Car with



The time-proved receptacle endorsed by big automotive engineers. The finest seamless drawn steel, tinned and tested—absolutely leakless—they carry your "gas" as it should be carried

**JANNEY, STEINMETZ & COMPANY**  
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### The Standard Vulcanizer Equipment for Repair Shop Use

A complete line, covering every requirement of the trade.  
—Vulcanizers, Retreaders, Tube Plates, Steam Rollers, Tools, etc.  
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For sale on the Pacific Coast by  
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**AKRON-RUBBERMOLD**  
TIRE REPAIR EQUIPMENT

\$1



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### Will Increase the Power Adds Fuel Mileage

For Automobiles, Aeroplanes, Trucks, Tractors, Motorcycles, Motor Boats, Stationary Engines.  
Insures easy starting, quicker acceleration, and a sturdy, uniform flow of power at all speeds, with greatly added fuel-mileage. Keeps plug points free from carbon. Fits all plugs. Protects entire ignition system. One EMO on each plug makes all cylinders pull even. Guaranteed.

DEALERS—Write for Sales Proposition.

\$1.00 Each at Dealers, or sent prepaid upon receipt of price. State make of car when ordering.

**THE EMO LABORATORIES,**  
2255 N. Illinois St., Indianapolis, Ind.

—is your crankshaft machining satisfactory?



### Moltrup's Experience — Moltrup's Methods

MOLTRUP'S MACHINERY—insure you absolutely accurate machining. And a new plant with increased capacity assures prompt delivery of large orders.

"MOLTRUP FOR QUALITY"

**Moltrup Steel Products Co.** BEAVER FALLS, PA.

## Electric Starting & Lighting Troubles Boiled Down

The author of this work spent weeks in the service stations of practically every important lighting and starting system manufacturer, for the sole purpose of getting facts on diagnosis and repair of electrical troubles. The book tells how to locate troubles and repair them.

Special attention is given to trouble testing by elimination, finding troubles by symptoms, and locating troubles by units.

Not a superfluous word is included. Exactly how to find and how to repair it—that is all you want to know and that is what is given.

This boiled-down service pocket book will enable YOU to locate electrical troubles and repair them without having to wade through masses of irrelevant matter. It will save time, money and patience.

36 PAGES

26 FIGURES

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## OLD SOL SPOTLIGHTS



"OLD SOL"

**No. 76 Liberty Searchlight. Price \$5.50**

Combined Push Button switch and focusing control in handle. Wing nut on bracket for inspection lamp. Double clamp bracket. Duplex wire to battery.

Three-inch mirror integral with lamp body, extra large silver plated reflector. Special high candle power bulb. Black enamel finish only.

Diameter of lamp front, 7". Weight, packed in 9 1/2 x 6 3/4 x 6 3/4 carton, 4 lbs.

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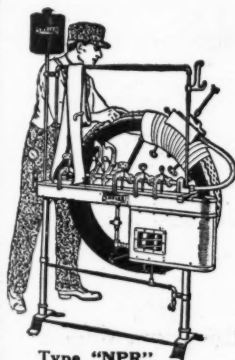
**THE HAWTHORNE CO.**

Grassmere Avenue

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## Make Money Repairing Tires

The high cost and limited supply of tires offers repair men a big opportunity to make money. Experienced help not necessary. A boy can do it easily.



Type "NPR"

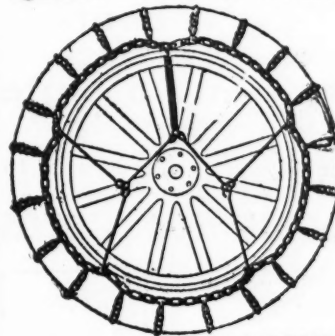
**SHALER**  
**SHOP VULCANIZER**  
Has Automatic Heat Control

Requires no watching or regulating. It works automatically. Easy to operate—can't overcure or undercure. Large Capacity—repairs 12 casings and 200 tubes a day. Type N. P. R., price \$70 subject to trade discounts.

Write for Catalog of the famous Shaler Vulcanizers—steam—gasoline—dry fuel and electric for Tire Repair Shops, Garage and Motorists' use.

C. A. SHALER CO., 237 Fourth St., Wausau, Wis.

## QUIET THOSE BANGING, RATTLING CHAINS!



**Merchant's Anti-Skid Chain Tightener**

Catches the chain at five points, giving an easy tension all around, with enough flexibility to allow the chain to creep on the tire. Get yours now. Write for full particulars.

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Exclusive Distributors: Gray-Heath Company, 1440 Michigan Ave., Chicago, Ill.

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A size for every business

INCOMPARABLE engine ability, axles, springs, brakes and frame of the best material and above all, unexcelled workmanship, characterize KISSEL TRUCKS.

See your nearest Kissel Dealer today

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"It Locks the Gears"

## Johnson Automobile Lock

A real thief-proof lock that fully protects unattended cars.

**Endorsed by Underwriters.**

A gear shifting lever fitted with a locking device—locks with Yale key. Made for

Auburn	Chandler	Oakland
Buick	Dodge	Oldsmobile
Cadillac	Haynes	Roamer
Case	Moline-Knight	Westcott

Durable—Simple—Safe. Easy to Install.

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A Selling Corporation

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Branch Office, St. Louis, Mo.



Exclusive Distributors

# TENAX

The original blue sheet. An ideal compressed asbestos packing for any joint. Tenax is permanent whether subjected to gas engine exhaust, cylinder explosions, acid, alkali, superheated steam or any other active agent. Can't burn, rot or squeeze out.

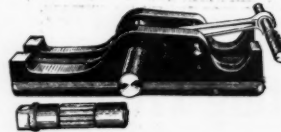
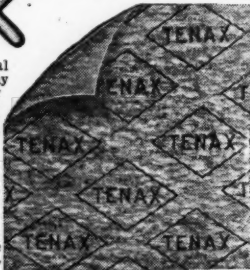
The finest packing made for Automobiles, Tractors, Gas Engines and Steam Engines. Sheets 50 inches square. Thickness 1/32 inch to 1/4 inch, inclusive. Made also in 1/64 inch thickness, black graphited sheet only. Pack with Tenax and forget the joint forever.

Write now for our New Automotive Supplies Catalog or ask your Supply House.

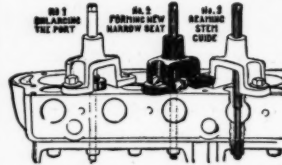
**ADVANCE PACKING & SUPPLY CO.**

13-15 North Franklin St., Chicago, Ill.  
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STORM Connecting Rod Bearing Reamer, Jig and Gauge.



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Are absolute necessities in every repair shop.

Our line includes:

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Write today for Bulletin No. A42 which gives full information.

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406 6th Ave., South  
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## HENRY'S PERFECTFIX PRODUCTS



A SELF-VULCANIZING PRODUCT FOR REPAIRING TUBES AND TIRES. No Heat or Tools required to complete a permanent and everlasting repair.

Motorists are convinced upon the first trial that Perfectfix is their greatest necessity at all times.

Perfectfix is recommended everywhere, therefore a great demand.

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Manufactured and Guaranteed by

**HENRY J. DEWITZ CO. MILWAUKEE, WIS.**



**ABC  
BRAKE  
LINING**

## The Radiator Hose for Your Trade

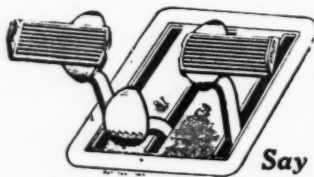
You would not sell your trade just ordinary tires, pumps or patches—they get the very best. And they will get the best in radiator hose if every length you sell carries the A-B-C trade mark. This quality hose is made of heavy duck in 3-Ply—made to withstand the action of oil, anti-freezing solutions, water at any temperature. Heat cannot affect it—it will not crack.

Stock the A-B-C Radiator Hose—and the A-B-C line—A-B-C Sheet Packing, A-B-C Fan Belt and A-B-C Brake Lining. Write for discounts and particulars.

**American Brake Lining Co.**

Lansdale

Penn.



**Jobbers  
Dealers  
"An Absolute  
Necessity"**

Say Users Referring to

## UTILITY Pedals for Fords

UTILITY Pedals are the most necessary accessories for Ford Cars. Users say so, and they sell in proportion to this demand.

Dealers—order from your jobbers.  
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Mfrs. of UTILITY Products

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Price

**\$1.25**



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PROTEXALL Overall! Suits, designed by experts, have a special spring back that eliminates all strain. No matter what position you are in while working on the car, you are always comfortable. PROTEXALL Overall Suits allow absolute freedom of movement and never bind.

Large, roomy pockets for your tools. Made of khaki, a material that stands rough usage and resists wear. Farmers, motorists, mechanics—all tradesmen—are highly pleased with this one-piece suit.

DEALERS—Protexall Suits are sold only through jobbers. Write direct if he cannot supply you.

**THE PROTEXALL CO., Abingdon, Illinois**



**Ball**

**Thrust Bearings**

made to meet  
your  
requirements

**"STERLING" UNIVERSAL JOINTS  
DROP FORGINGS**

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**Ball Retainers**  
for Thrust, Magneto  
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Equipment and Supplies  
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**MOTOR CAR—TRUCK—TRACTOR  
MOTOR-BOAT—AEROPLANE**

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**FIRESTONE DEMOUNTABLE RIMS**

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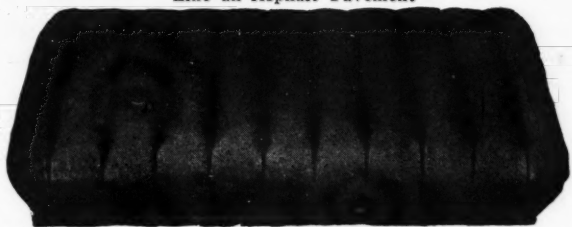
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Make Your Ford Ride Like a Packard or Pierce Arrow with a

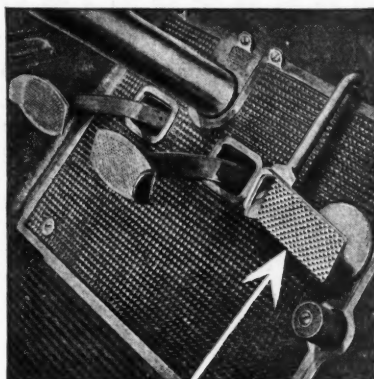
## Cathedral Pipe Deluxe Cushion

The Only Cushion in America That Makes All Kinds of Roads Seem Like an Asphalt Pavement



No Shock Absorbers Necessary. Sold Under a Positive Guarantee to Make Your Car Ride 100 Per Cent Better or Your Money Back. Let Us Tell You More About It.

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Adjustable for all cars. A solid, comfortable support that tips sideways. Simply mounted over present throttle. Aluminum with bronze bearing. \$2.50.

Jobbers and Dealers Write

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Sole Manufacturers

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BENDIX DRIVE

for electric starters

AUTOMATIC ENGAGING AND DISENGAGING

Used by

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## Speed

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ROGERS ALL-STEEL TRAILERS, in all models, styles and sizes (½-ton to 10-ton capacity). Dumping Trailers, 4-wheel and 2-wheel Trailers, Semi-Trailers, highest quality, easiest running, longest lasting.

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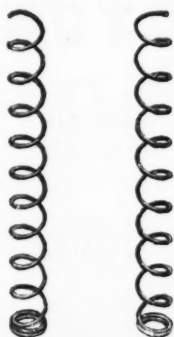
Price 50c the Pair

Two simple little coils which keep grease and oil from dripping out of axle ends. Save tires—Save brakes—Save differentials.

Liberal profit for the dealer.

EMCO MFG. CO., INC.

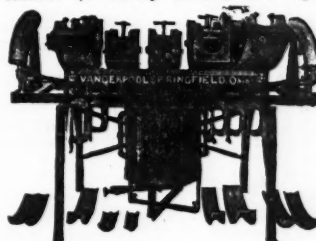
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Left Pat. Pending Right

## ENORMOUS INCOME FROM INSIGNIFICANT INVESTMENT

Open a Tire Repairing Shop—business pours in. Vanderpool Vulcanizer (5 Cavity Model) has capacity of \$100 worth of work a day. We are the pioneer manufacturers of the Dry Cure Vulcanizer—the only vulcanizer that guarantees absolutely PERFECT work. We send you FREE TIRE REPAIRING MANUAL and give you free instruction. Write today for full particulars.



In answering address Dept. P-15

Wm. Vanderpool Co., Springfield, O.

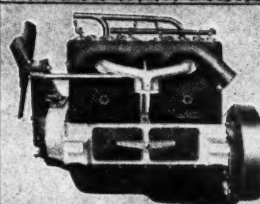
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SCIENTIFIC IGNITION

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*Waukesha*

4-CYLINDER MOTORS

FOR TRUCK OR TRACTOR

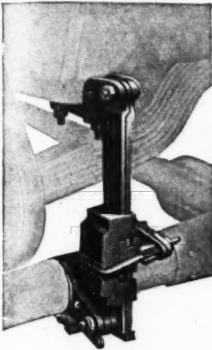
Power Plants That Have the Character and Stamina to Withstand the Most Drastic Tests

WAUKESHA MOTOR CO.  
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**A True  
SHOCK ABSORBER**  
The  
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Compression of the car springs is unrestricted but the instantaneously acting clutch checks the rebound.  
Mechanically correct; initial cost low; long lived; easily attached to car.

Manufactured only by  
**J. S. LANG ENGINEERING COMPANY**  
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*Correspondence Solicited*

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TRADE  MARK  
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Oil and  
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*Jobbers and Dealers:  
Send for samples and  
complete catalog.*

**THE BELL PUMP &  
MFG. CO.**  
74 Fort St. East  
DETROIT, MICH.



Bell Tire Pump \$3.50

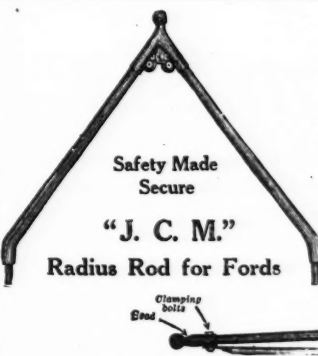
**BRACEFORDS—The Ace—Brace  
FOR FORDS**



Placed at all **Four Points** where the fenders meet the runboards, holding both running-boards and fenders rigid. **Stops the shake, destruction, Noise.** Visible to all. Self-selling. Self advertising. Strap Lug-gage to them. Strap-slots in each.

Dealers—This is not a chance—it's an opportunity.

\$4.25 SET OF FOUR \$4.25  
Two on Each Side  
With Bolts and Nuts  
Your Jobber Has Them.  
If Not, Write Us Direct.  
**Prince Manufacturing Co.**  
SUMTER, S. C.



Safety Made  
Secure  
"J. C. M."  
Radius Rod for Fords

**J. C. M. RADIUS RODS** are stronger — safer because of the weldless, non-brazed joint. The rods are inserted and clamped into a patented socket—while the axle end of the rods are made unbreakable.

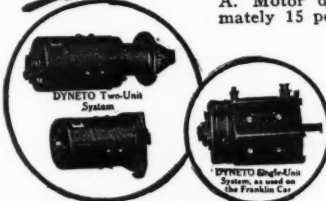
The J. C. M. Auxiliary Brace, shown below, eliminates steering wheel oscillation.

*Dealers write for profitable trade proposition.*

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**J. C. M. Radius Rod**

***Dyneto*** **STARTING  
LIGHTING  
SYSTEMS**



THE DYNETO shows greatest efficiency in both motor and generator. Type D. A. Motor develops a torque of approximately 15 pounds. Type C. A. Generator shows approximately 15 amperes.

A car-speed of 15 to 20 M. P. H. keeps batteries fully charged.  
Starter always sure to start.  
Lamps always bright.  
*Send drawings and specifications for our recommendation.*

*Special Outfits for Fords*

**DYNETO ELECTRIC CORPORATION, Syracuse, N. Y.**

**"DEFIES TIME AND THE ELEMENTS"**

**CHASE  
DREDNAUT  
Motor  
Topping**

*Write for Samples and Particulars*

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New York      San Francisco      Detroit      Chicago

**SCHEBLER  
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" Uniformly Dependable "

The Wheeler-Schebler Carburetor Co. Inc.  
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RINGS**



**ELIMINATE  
ALL PISTON  
RING TROUBLES**

THE  RING COMPANY  
MUSKEGON • MICHIGAN



# Red Head



## Spark Plugs

the kind with the  
**Vitrystone insulator**

*more spark! less gas!*

**Red Head Spark Plug Corporation**  
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## Dealers! Garage Men! Repair Men!

Investigate the Le Bron Buffer and Power Plant. Air outfit connected if desired. 2, 3 and 5 H.P., any voltage; dust-proof and ball bearing motor.

**USERS:** This outfit will pay for itself immediately

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# Winton Six

See the latest Winton Six, and you will instantly recognize a most distinguished car—delightful to behold, a joy to own, a car that makes you feel good all over.

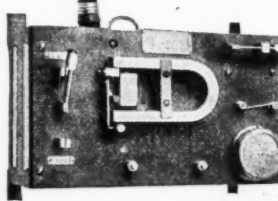
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## FORE RECTIFIER TYPE 2-B

### Charges Battery at Cost of 5 to 15 Cents

Will charge two 6-volt batteries at 6 ampere charging rate at one time or four 6-volt batteries at 3 ampere rate or one 12-volt battery at 6 ampere rate. Is self-starting and upon resumption of line current the charging is continued. Entirely safe to put battery on charge during the night. Battery can not be harmed by leaving it on over charge.



The efficiency of the Fore Rectifier is high so that the current consumed is very small. There is no maintenance expense or depreciation so that the cost per charge is simply for the current put into the battery.

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**Old Tires Covered Complete**

**Try 2 or 3 sections over any old blowout. Can't have blowouts, punctures; neither can the rubber wear off.**

**Anti-Skid**  
Mud chains can be put on in a jiffy with one hand while standing on the running board. Hook the ends together and push the little lever. If you get in a mud hole you will laugh out loud.

*Special prices to those in new territory*

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Body builders who use these nails demand something more than the ordinary upholstery nail—that's why they use Lethermet Nails.

Lethermet Nails come enameled to match practically any shade of leather or upholstery in plain or Spanish effects. Send for our catalog containing prices.

**THE BREWER-TITCHENER CORP.**  
*Makers of Standard Body Parts*

**CORTLAND NEW YORK**

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### With The Alternating Current Battery Charger.

ST. LOUIS M. U. RECTIFIER.

In every community the use of the low voltage storage battery has created a demand for a charging system which can be operated from an alternating current.

**THIS CHARGER** is simple to operate, and may be hung on the wall or carried to car and connected to any lamp extension.

**LOW COST** and small operating expense make it suitable to individuals and to garagemen.

—WRITE FOR LITERATURE—




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### It Vaporizes the Starting Charge

Universally accepted the standard primer for motor trucks, tractors, passenger cars, airplanes and motor boats. The most perfectly constructed and most efficient primer on the market.

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**\$ ...to the Machine Shop?  
...to the Junk Man?  
...to your Cash Register?**

Don't junk or send that next crank shaft job to a machine shop. When crank pins are pounded out of round, don't waste time trying to scrape bearings to them. Flat pins are easily and quickly rounded, allowing for perfect adjustment, with an

### Atlas Abrasive Tool

A hand tool designed for use in your own shop. The most simple, inexpensive, satisfactory and profitable way of handling crank shaft jobs. Price of tool complete \$10 by parcel post. Extra cutter (good for truing up from 10 to 20 pins) 30c each, post paid. Capacity 1 1/4 to 2 1/2 inches diameter.



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The readiness with which STANDARD motor trucks adapt themselves to conditions in every line of heavy haulage has been proven by hundreds of progressive business firms in diversified lines of work. STANDARDS give complete satisfaction at all times by their adaptability to meet varying conditions.

Dealers—Write for territory.

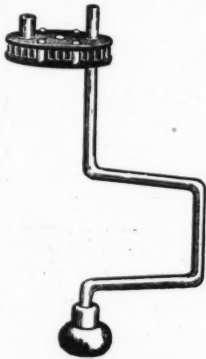
**STANDARD MOTOR TRUCK COMPANY, Detroit, Mich.**

"ALL THE NAME IMPLIES"



**Standard**

**Motor Trucks**  
1, 2, 3 1/2, 5-Ton



### UNIVERSAL Offset Speed WRENCH

Pat. Pend.

Removes the FORD FOURTH CONNECTING ROD NUT in three minutes. Made strong—all steel, 3-inch offset. Sent prepaid for \$5.00. Ask your jobber. If he can't supply you, write us.

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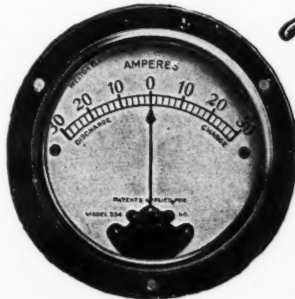


THE Mercer shield is the badge of fastidious taste in automobile. Mercer means the utmost in substantial smartness, riding comfort, and power. The possessor of a Mercer invariably feels a bit better satisfied than the owner of another car. Correspondence from dealers invited.

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If you had only known that your battery was going dead! But there is one sure and dependable way of knowing whether your generator is working and your storage battery receiving its proper charge. Put a



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MODEL 354 AMMETER

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**Weston Electrical Instrument Co.**  
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Fisher Rim Grip Sub Casings give from 2,000 to 4,000 extra miles from tires, hold all the pressure of inflated tube, completely reinforce all parts of tire, prevent blowouts. Made of piles of finest grade rubberized fabric with pure rubber outside layer.

Dealers: Liberal Discounts make it worth your while selling them. Write us today.

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THE **Fisher**  
RIM-GRIP SUB-CASING



**12,480  
MILES SERVICE  
ON THIS TIRE  
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" ROCKFORD, ILLINOIS "

Sales Offices in All Principal Cities.

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### CARBURETOR SUPREMACY

In carburetor Simplicity, Power Reliability and Economy is based upon certain proven facts—well-known to ZENITH users.

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New York DETROIT Chicago



You Should Carry:—

### The ZIP Spark Plug 1\$

2.00  
Safety Connection  
for Tire Pumps—Set it  
at required pressure—the buzz  
of the escape valve tells you when to  
stop. Guaranteed accurate.  
The Hartley Screw Co., 132 Central Ave., Newark, N.J.  
See ad. next week—or in MOTOR WORLD this week. Liberal Discounts.

Its non-corrosive copper alloy  
shell will not "freeze" in  
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TRUCK

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1 Ton  
\$1395  
1½ Tons  
\$1595  
2½ Tons  
\$2450

Write for our  
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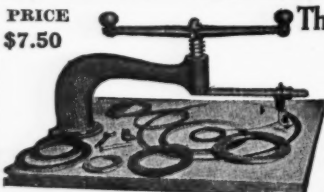


### THE ORIGINAL PITTSBURGH VISIBLE SPARK PLUG

You can see and detect ignition trouble. Spark gap, which  
is adjustable, also acts as an intensifier and prohibits carbon.  
This plug cannot short circuit leak compression and is practically  
unbreakable. More real selling points than others offer. Get our  
liberal dealer proposition. WE PAY THE WAR TAX.

PITTSBURGH VISIBLE SPARK PLUG & MFG. CO.  
Pittsburgh, Pa.

PRICE  
\$7.50



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Lamp Glass, Sheet Copper  
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Capacity any size circle from 0 to 14 in.  
Positive measuring scale to determine  
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For Ford Dealers and Jobbers

### The DORIC

Rolls-Royce Type Radiator  
for Ford Cars

"Permanently Beautiful"

Better Cooling, Less Trouble, Longer Life.

The MOTOR TRUCK RADIATOR & MFG. CO.

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Indestructible Radiator for  
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Enormously Popular

Write for Proposition

Scientifically built  
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—the new fire-fighting dry chemical guaranteed to extinguish  
a fire in less than two seconds. It is put up in one-fourth  
gallon handy metal cylinders which have the extinguishing  
power of 41 gallons of water.  
Feumort has no pumps or valves to rust or corrode. Fits  
on any car or truck. \$5.00 each.

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### NON-BURN ASBESTOS BRAKE LINING

H. W. JOHNS-MANVILLE CO.

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10 Factories—Branches in 63 Large Cities



Inner armor  
for automobile

INSYDE tires pre-

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Double mileage of any tire, old

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Used over

and over in several tires. Will not heat or pinch. Cheaper

and better than double treads, etc. Details free. Dis-

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"World's Largest Auto Supply House"

Main Office, New York, N. Y., 1765 Broadway

We operate 27 direct branches in 23 leading cities  
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### For Ford Cars - The Wheel that Won't Come Off.

With patented reverse taper construction and hub-cap  
wedges, wheel positively cannot come off by accident.  
Safety, beauty and comfort. Saves tires. Quick, easy  
changes. Set 5 wheels, \$70. Order through Ford dealer.  
Write for further information or dealer's proposition.

Stewart Wire Wheel Corporation

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The Stewart Hub Makes Safety Sure

## GILLETTE TIRES & TUBES

Products of the Improved Gillette Chilled Rubber  
Process. Refining treatment that toughens rubber  
as iron is toughened by conversion into steel. Not  
affected by climatic conditions. Greatest mileage  
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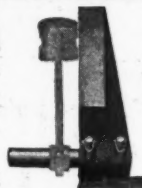
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Work completed in one-fifth of former time. Ac-  
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The Power of the Hour

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Preferred and used by the largest tire factories in America.  
Consult us before remodeling or increasing your facilities.

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Everything in Tire-Repair Machinery and Tools. Akron, Ohio



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Four cylinder Automobile Motor  
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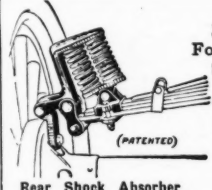
The Aerodyn Valve will save 25% of gas on the same mileage and increase the power of your motor up to 20%. If it don't do it to your satisfaction, send it back and get your money—you're the judge. Installed in fifteen minutes—costs but \$4.50.

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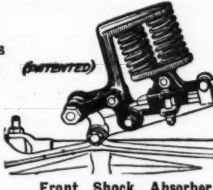
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Four Absorbers In Car Set  
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(PATENTED)  
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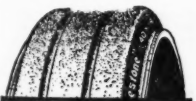
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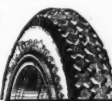
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## Firestone TIRES





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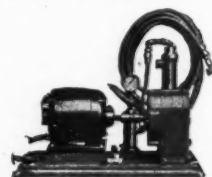
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Hair and Leather in  
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Heavy Grease Guns.....	1.50
14,000 ft. new radiator hose. Price per ft., 1-in., 15c; 1 1/4-in., 17 1/2c; 1 1/2-in., 20c; 1 3/4-in., 22c; 2-in.,	
25c; 2 1/4-in., 27 1/2c; 2 1/2-in., 30c; 2 3/4-in., 32 1/2c.	
NEW LAMPS	
11 inch single bulb.....	\$6.00
10 inch single bulb.....	5.00
Electric, tail-lights.....	.85
Electric side lights, pair.....	1.75
NEW BRAKE LINING	
Price per ft.	
1 1/4-in., 20c	1 1/2-in., 25c
1 1/2-in., 30c	2-in., 30c
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Price per ft.	
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32x4	.....	17.50	35x4 1/2	.....	27.50
33x4	.....	20.00	35x5	.....	30.00
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10% Deposit Required with each tire ordered  
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30x3	.....	\$1.75	34x4	.....	\$3.00
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New Sims H T.....	18.00
Mea.....	12.00
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Silent Starter and Generator  
Chains; all lengths and sizes.

New 8-cyl. Delco distributors, 12.00

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Allis Chalmers.....	15.00
Remy 182.....	20.00
Packard.....	20.00
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\$150.00 to \$550.00  
50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

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New Baker wedges and bolts, 10c ea.

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# PARTS FOR ALL CARS

We Save You 50 to 80% of the Original Cost

## SATISFACTION OR YOUR MONEY BACK

New Spotlights, 5" lens with mirror.....\$3.48

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Model B.....\$4.00 ea.  
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Jones Starter and Generator..... 20.00

### GENERATORS

Gray & Davis.....\$14.00  
Remy ..... 12.00  
Vesta ..... 10.00  
Silent Starter and Generator  
Chains, all lengths and sizes.  
Lighting and Starting Batteries.....\$6.00 to \$15.00  
Rims ..... 1.50 to 3.50  
Carburetors ..... 3.50 to 7.50

5% Off for Cash in Full with Order.

Deposit Required with All Orders.

Get Our Prices on New Tires.

## Magnetos Overhauled and Guaranteed

Bosch DU4 Variable.....\$27.50	Bosch DR4..... 19.50	Bosch D6..... 15.00
Bosch DU4 Set Spark..... 25.00	Bosch DR6..... 20.00	Eisemann..... 12.00
New Bosch DU4 Variable..... 35.00	Bosch ZR6..... 35.00	Remy..... 6.00
Bosch DU6..... 29.00	New Bosch ZR6..... 40.00	Dixie..... 12.00
	Bosch D4..... 14.00	

## OUR SLIGHTLY USED Tires and Tubes

OBTAINED FROM WRECKED CARS  
Mean Economy to You—A Trial Will Convince You

Size	Tires	Tubes
30x3	\$ 4.50	\$1.35
30x3 1/2	5.50	1.45
31x3 1/2	5.75	1.50
32x3 1/2	6.00	1.50
31x3 1/2	6.50	1.60
31x4	7.00	1.65
32x4	7.50	1.60
33x4	8.50	1.70
33x4 1/2	9.00	1.75
34x4	8.50	1.70
35x4	9.00	1.75
34x4 1/2	9.00	1.75
35x4 1/2	9.25	1.80
36x4	9.50	1.85
35x4 1/2	15.00	2.50
40x1 1/2	15.00	....
42x1 1/2	25.00	4.00
35x5	10.25	2.00
36x5	10.25	2.00
37x5	10.75	2.20
38x5 1/2	15.00	....
40x4 Non Skid..... 15.00	....	....
43x4 1/2 Cl. Non Skid..... 15.00	....	....

Express Must Be Prepaid on Old Tires Sent to Us.

## Special New Clincher Tires

32x4.....\$10.00    33x4 1/2.....\$12.50    34x5.....\$12.50

## Double tread Tires

Selected from best used material obtainable.  
Reliners, \$1.25 Extra

Two tires, one with good top and other with good sidewalls are trimmed, cemented and sewed firmly together by Campbell lock stitch method, twelve to fourteen plies fabric making puncture and blowout almost impossible.

Size	Complete tire	You furnish one tire	You furnish both
28x3	\$ 4.15	\$ 3.00	\$ 1.50
30x3	4.75	3.35	1.50
30x3 1/2	5.80	4.25	2.00
31x3 1/2	6.50	4.50	2.00
32x3 1/2	6.75	5.25	2.00
34x3 1/2	7.00	5.60	2.25
31x4	6.95	5.75	2.50
32x4	7.15	5.65	2.50
33x4	7.80	6.25	2.50
34x4	8.00	6.45	2.50
35x4	8.75	7.15	2.50
36x4	9.40	7.50	2.50
34x4 1/2	9.25	7.60	3.00
34x4 1/2	9.65	8.00	3.00
35x4 1/2	10.15	8.20	3.00

## NEW GEARS FOR ALL CARS

**REBUILT BATTERIES**  
Guaranteed for 6 Months  
6 Volt Starting and Lighting Batteries.....\$13.50  
12 Volt Starting and Lighting Batteries..... 18.50

### MOTORS

In Excellent Condition  
Continental Model E.....\$75.00  
E. M. F. 30..... 50.00  
4 cyl. Studebaker 25..... 50.00  
4 cyl. Everett 30..... 45.00  
4 cyl. Davis 30..... 50.00  
Overland 69..... 60.00  
Overland 83A with starter and generator..... 100.00  
Overland 83B block motor with starter and gen..... 90.00

### UNIT POWER PLANTS

Continental Model E.....\$115.00  
Chalmers 30..... 65.00  
Rutenber Cyl..... 80.00  
Radiators.....\$10.00 and up  
Speedometer Heads.....\$1.00 to \$3.00  
Axle Shafts.....\$2.50 to \$7.50  
Front Axles..... Springs  
Rear Axles..... Transmission Gears  
Transmissions..... Differential Gears  
Roller Ball Bearings (All Makes), \$1.00 to \$3.50. Pistons, Cylinder Blocks, Crank and Camshafts, etc.

Full Cash Refunds, less Express Charges, Allowed on Returned Goods. Prompt Attention to Your Orders.

# MOTOR SALVAGE CO. 1425 S. State St. CHICAGO, ILL.

# Get It When You Want It

A Million Parts a Year Pass Through Our Great Shops—Immense Variety Always on Hand. Bargains

# A Partial List of Big Savings In Stock Now!

### GENERATORS

Leece Neville 6 volts.....\$ 15.00  
Leece Neville 12 volts..... 20.00  
Ward Leonard..... 15.00  
Auto Lite Model GB..... 15.00  
Auto Lite Model GC..... 17.50  
Auto Lite Model CG..... 15.00  
Gray & Davis Type T..... 12.50  
Apico Mod. A 25 12-volt..... 15.00  
Apico Mod. A 25 6- and 12-volt..... 15.00  
Westinghouse 201..... 20.00  
Westinghouse Gen. & Distr. S A 76 6 cyl..... 17.50  
Remy Model 16..... 15.00  
Remy Gen. & Distr. Model O B..... 25.00  
Deaco Gen. Model U F 8-volt..... 17.50

### RELINERS

28x3.....\$0.75  
30x3..... .75  
30x3 1/2..... 1.50  
32x3 1/2..... 1.50  
34x4 and larger..... 2.00

### BLOW OUT PATCHES

3-3 1/2-4 in., each.....\$0.25  
Dozen Lots..... 2.25

### INNER TUBES

#### New Stock

34x4.....\$2.50

### VULCANIZING CEMENT

1-pt. Can.....50c

1-qt. Can.....75c

### PATCHING OUTFIT

Patching Rubber & Cement

Regular Price.....50c, 75c, \$1.00

OUR Price.....25c, 50c, 75c

### RADIATOR HOSE

Pieces 1 1/2x12 in.....15c

### MAGNETOS

Dixie.....\$ 15.00

Simms..... 15.00

Bosch N14..... 15.00

Bosch D4..... 17.50

Bosch DR4..... 25.00

Bosch DU4..... 30.00

Bosch ZR4..... 40.00

Bosch ZR4 2-spark..... 100.00

Bosch D6..... 25.00

Bosch DR6..... 35.00

Bosch DU6..... 35.00

Bosch ZR6..... 50.00

## NEW TIRES--CHEAP

We bought a carload, all firsts, guaranteed 5,000 miles, not damaged or old stock. Serial numbers and maker's name intact, which will carry factory, as well as our guarantee.

30x3 1/2 rib.....\$12.88	34x4 1/2 rib..... 30.06
31x4 rib..... 20.05	35x5 N. S..... 41.36
31x4 N. S..... 21.74	36x4 1/2 rib..... 31.52
33x4 rib..... 21.60	36x4 1/2 N. S..... 33.91
33x4 N. S..... 22.20	37x5 rib..... 38.62
34x4 rib..... 21.92	37x5 Q. D. N. S..... 43.54
34x4 N. S..... 23.81	

Mail orders filled promptly. Cash with order or 25 per cent deposit, balance C.O.D.

### TUBES

30x3.....\$2.00	33x4.....\$2.50
30x3 1/2..... 2.25	34x4..... 2.50
32x4..... 2.50	

IRON CLAD GUARANTEE: Absolute Satisfaction or Money Immediately Refunded. No Quibbling on Our Part

The Original "We Tear 'Em Up and Sell the Pieces"

# AUTO WRECKING COMPANY

13th and Oak Streets

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Parts and Repairs

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## ALL PARTS FOR ALL CARS

## YOU CAN TEACH A PARROT TO SAY "JUST AS GOOD"

But he won't know what he's talking about.  
Beware of that old "stall" we have something just as good.  
Insist on getting PURITAN EQUIPMENT.

## WE DO NOT WRECK CARS

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Send for Monthly Bulletin—"Wise Buys for Wise Buyers"

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We have an enormous stock of all makes and sizes of demountable rims and wheels—have them right in stock and can make immediate shipment. Write for prices.

#### RADIATORS.

Brand new Honey Comb radiators for all makes of cars; guaranteed to be right. No matter what car you may need a radiator for, write us for prices.

#### ELECTRICAL EQUIPMENT.

6-Volt Autolite Generators.....\$15.00  
6-Volt Menominee Generators..... 15.00  
6-Volt CC Atwater-Kent Coils..... 4.50  
6-Volt Ward Leonard Starting Motors ..... 16.00

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For Scripps-Booth, brand new.....\$30.00  
Bosch DU4 Magnets, variable spark, rebuilt but guaranteed. 35.00

#### FOR FORDS.

Speedster Bodies, beautiful, racy lines .....\$60.00  
Sporty Racing Type Bodies with Top and Shield.....120.00  
Honey Comb Radiators, 1910 to 1916 models ..... 20.00  
Honey Comb Radiators, 1917 to 1919 models ..... 20.50  
Crown Fender, good heavy type, set ..... 14.50  
Speedster Fenders, set of four..... 10.00  
One-Man Mohair Tops, touring, complete ..... 35.00  
One-Man Mohair Tops, roadsters, complete ..... 25.00

#### ELECTRIC LIGHTING SYSTEM.

Includes Generators, Battery, two Side Lamps, Tail Lamp, Wiring, Switches, etc. Price for complete system .....\$17.50  
30x3 1/2 Reliners ..... 2.10  
30x3 Reliners ..... 1.95  
Roller Bearing for Front Wheels, set ..... 7.50

6-Volt Menominee Generators, with attachments, for Fords...\$23.50

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Rear Gasoline Tanks, 28 in. long, 12 in. wide, with Gauge, for vacuum feed .....\$ 8.00  
Timken Front Axle, left hand, complete with Hubs and Bearings ..... 30.00  
Timken Worm Drive Truck Axles with Hub and Drums..... 85.00  
Front Bumpers for Chevrolet, 490 Channel Type ..... 5.00  
Kingston Carburetor, 1-inch top intake ..... 5.00  
Schebler Model R 1-inch top intake ..... 12.50  
Brown Spotlights ..... 3.75  
Steering Gears, left or right hand ..... 15.00  
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#### STARTING BATTERIES

Brand New 6-Volt Starting and Lighting Batteries, guaranteed, can be used on most every car .....\$25.00  
One-Man Khaki Tops—complete with curtains and Dust Boot. Can fit any Maxwell models, either Roadster or Touring. Price, each, while they last.....\$25.00  
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Crown Fenders—thousands in stock .....\$4.00 up  
Buick Radiators—All New Models 10, 17, 21, 39.....\$25.00  
Models 40, 43..... 35.00  
Models C-25 ..... 32.00  
One-Man Mohair Tops for Chalmers touring cars..... 30.00  
Rain Vision Windshields for Buick Models C-45, D-35, 4-45 20.00

#### SPRINGS.

New Springs for all cars. Write for Prices.

**PURITAN MACHINE CO.** 904 PURITAN BLDG. **DETROIT, MICH.**  
EASTERN BRANCH: 245 WEST 55TH ST., NEW YORK, N. Y.

#### Prompt Service Satisfaction Guaranteed

#### Overhauled and Guaranteed MAGNETOS

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Bosch D. U. 4 Variable ..... 25.00  
Bosch D. U. 6..... 27.50  
Bosch D. R. 4..... 20.00  
Bosch D. R. 4—2 spark ..... 65.00  
Bosch D. R. 6..... 25.00  
Bosch D. 4..... 15.00  
Bosch D. 6..... 16.00  
Bosch D. 6—2 spark..... 45.00  
Eisemann 4 Cyl..... 12.00  
Mea ..... 10.00  
Remy ..... 5.00  
Splitdorf ..... 5.00

#### COILS

Bosch, Type A.....\$ 6.00  
Eisemann ..... 3.50  
Splitdorf ..... 3.50

#### STARTERS

Gray & Davis.....\$15.00  
Delco ..... 20.00  
Jones Starter & Gen. 17.50  
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New Gears and Shafts for 200 Cars  
PREST-O-LITE TANKS MODEL B, \$4.00; MODEL E, \$3.00  
Searchlight Tanks, \$2.00

New Bosch D U 4 Variable, \$32.50. Write for special quantity prices.

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5% Off for Cash in Full with Order **WRITE FOR PRICES** Deposit Required With All Orders

#### MONEY CHEERFULLY REFUNDED

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4 Cyl. Pierce Arrow..... 90.00  
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4 Cyl. Continental..... 65.00  
Model R..... 65.00  
R. C. H..... 60.00  
Overland 59..... 60.00  
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#### RIMS

All Makes and Sizes .....\$2.00 up  
All Parts for 2 Cyl. Grabbowsky Trucks.  
Front and Rear Axles, Axle Shafts.  
Complete Rear Ends.  
Transmissions—Universal Joints.  
Bearings—All makes and sizes.  
Differentials—Gears, Springs, Radiators, etc.

**SCHEAFFER AUTO PARTS CO.** 1610 S. State St. CHICAGO, ILL.

#### New and Guaranteed

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#### TRANSMISSION AND DIFFERENTIAL GEARS IN STOCK

### FOR OVER 100 DIFFERENT MAKES OF CARS

BEVEL DRIVE GEARS FOR THE FOLLOWING CARS

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All parts secured from the same source as were those supplied by the original makers of these cars.

Complete stock on hand.

Shipments promptly and correctly made.

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We have ready for immediate shipment a large stock of Magnetos, Carburetors, Complete Motors, Bodies, Axles, Blacksmith Anvils, Spark Plugs, Electric Motors, Fuel Tanks, Vises, Speedometers, Lenses, etc., etc. We furnish everything for the motor car at suprisingly low prices.

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Write today

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Racing radiators, suitable for Fords .....	\$12.00
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Gears for Transmission and Differentials Our Specialty.

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We carry a complete stock of repair parts and can make shipment the day order is received. Our stock includes a complete supply of Weidely 12-cyl. motor parts.

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Buick F-10-16-17-19-25-28-29-30-31	Marmon 30—Rear axle & transmission
Burg 40	Maxwell 2 & 4 cylinder;
J. I. Case 40	K-Q-25—Mitchell 40
Carter Car 5A-L-R	Moore 40
Chalmers F-K-L & Six 10-11M-18—Clark 40	Mason "May Tag" 4 cyl.
Cadillac 1909-1910	Monarch 40—Moline
Cameron—Crawford	Monroe
Detroit—Enger 40	Overland 30-32-35-38-41-42-52-56-59-69-71-75BB-79-81-83
E. M. F. 30—Pal Car	Oldsmobile 40
Flanders 2 & 3 speed	Oakland 2 & 4 cyl. 30-40
Firestone Columbia	Packard 1910—Premier
Fuller	Paige Detroit 25 H. P.
Ford—N. R. & S.	Pullman 40
Great Northern	Reo 2 & 4 cyl. 4th & 5th
Halladay—Haynes 1910	Rider Lewis—Sellers
Herreshoff—Hupp 20	Rambler 34-40-44-53
Hudson 20	R. C. H.—Regal 30
I. C. H. 2 & 4 cylinder	Stoddard Dayton 40
Jackson 2 & 4 cylinder	Studebaker 14-25-35
Olympic-Majestic 45-50E	Vellie 30-40
Kissel Kar 40	Winton Six
King—Knox 40	Wayne
Lambert 2 & 4 cylinder	
Lexington 40	

Complete Motors, Transmissions and Rear Axles. Money refunded on all parts within 10 days if unsatisfactory.

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**SERVICE**—Every inquiry will receive prompt attention. Orders shipped same day received. Satisfaction guaranteed or money refunded.

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Two Wisconsin motors, 5 1/4 x 7 in. stroke, 4 cyl.; and 5 1/4 x 5 1/10 in.; seventy Houk wire wheels, 32 x 4 in.; twenty American ball bearing rear and front axles; seven steel frames, Parish & Bingham; four sets Westinghouse shock absorbers and many other automobile parts to be disposed of at great sacrifice.

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**CUT DOWN H. C. OF L 50% TO 75%** By ordering your auto supplies from us. Our old customers are our Best Friends

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Indianapolis, Ind.

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We can make immediate shipment of any part required in the repair of your Hal motor.

Don't pay a premium for, nor run the risk of using, second-hand parts when you can get NEW PARTS, exact duplicates made from original patterns, by ordering direct from the factory that built your motor.

Deal with headquarters and be assured of good reliable parts at a fair price.

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**SAVE 25% TO 75% ON USED PARTS** For most makes of cars. Complete motors or parts for same. Gears, Magnets, Axles, Radiators, Transmissions**WE HAVE LARGE STOCK OF BRAND NEW MAXWELL, OVERLAND AND OTHER PARTS AT FOLLOWING PRICES:**

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Radiators at \$10.00 and up for almost any make of car.			Chevrolet Axle Shafts—model 490....3.00

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Write today for prices of parts not listed.

House of Nearly 3,000,000 Parts

Auto Salvage &amp; Wrecking Co.

**PARTS**ALWAYS TEARING 'EM UP—  
—AND SELLING THE PIECESYES!  
PARTS FOR  
ALL CARSMagnets,  
Gears, Motors,  
TransmissionsRadiators,  
Axles  
'n Ever'thingALSO TIRE  
BARGAINS  
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**We Can Save You Money On  
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You will find our prices very attractive. We are selling used parts at bargain prices from 50 per cent to 75 per cent off manufacturers' list prices. Compare our prices with others. A large stock of parts always on hand. Satisfaction of your money back. Prompt service.

Send us an order today

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One Hundred 8-cylinder motors, 3 in. bore by 4½ in. stroke. Brand new and block tested. \$100.00 each. New equipment including Atwater Kent distributor and coil, Stewart carburetor, Dyneto Starter and Generator, \$100.00 extra.

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1910-1919 Buick, Cadillac, Dodge, Studebaker, Pope, Packards, Pierce, Etc.

Motors .....	\$25.00 up	Presto Tanks .....	\$ 4.50 up
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Carburetors .....	3.00 "	Generators .....	10.00 "
Rear Axles .....	15.00 "	Gears .....	1.00 "
Front Axles .....	5.00 "	Bearings .....	1.00 "
Cylinders .....	5.00 "	Radiators .....	10.00 "

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EXCHANGE**

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**Brand New Parts**

Including Transmission Gears, Differential Gears, Axles, Universal Joints, Clutch Linings and Parts, Cylinder Head Gaskets, etc. Lowest prices consistent with quality and

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**Write For PARTS For the Following Cars**

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BACK AND SIDE CURTAINS  
SEAT COVERS

For All Cars

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Complete Roof and Back, Ready to Put On

Roadster .....	\$ 8.75
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Roadster .....

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Write for particulars  
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**CRAIG-HUNT** Parts are the safest and **BEST**  
**COMPLETE SET**, for lowering the Ford Frame

\$25.00

We make 16 valve Racing Heads, Racing Bodies,  
Pistons and counterbalances for the Ford

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**Lozier Owners—**Why buy counterfeit  
repair parts? We have all Original  
Parts. Made from original patterns.  
Order from headquarters.

**LOZIER MOTOR COMPANY**  
FORT AND 6th STREETS, DETROIT, MICH.

SERVICE STATIONS:  
E. A. Cornley, Inc., 1445 Bush St., San Francisco, Cal.  
Lozier Motor Co., 47th St. & 11th Ave., New York City

**REO PARTS**

Model 1915; absolutely guaranteed in first class con-  
dition; motor transmission, rear axle, carburetor,  
wheels, etc. Wire or write.

**CLEARFIELD CENTRAL GARAGE CO.,**  
Clearfield, Pa.

**PATTERSON AUTO PARTS WORKS**  
Muskogee, Okla.

**"EVERYTHING FOR EVERY CAR"**

We Sell Cheaper

FIRST CLASS USED MOTORS, \$25 to \$150

Satisfaction Guaranteed. Try Us.  
**BOTH NEW AND USED PARTS**

**RIMS ALL  
MAKES WHEELS**

Pneumatic Tire Wheels for Ford Trucks.  
Five Detachable Wire Wheels for Fords.  
Complete Catalogue on Request

**CHICAGO WHEEL & RIM CO.**  
2010 Wabash Avenue CHICAGO, ILL.



## Parts and Repairs

## LATE MODEL PARTS

Chandler.....16 and 17 Mitchell.....17 and 18  
Anderson ..... 18 Chalmers ..... 18  
Velle ..... 17 Cole ..... 8

We are not the biggest parts company, but we have  
a large stock of late parts.

Satisfaction Guaranteed

## AUTO PARTS CO.

Tulsa,  
Okla.I. Wolf Auto Parts & Tire Co.  
"A Million Parts"

—35% to 80% Off Manufacturers' Price—  
Guaranteed parts for most all models. Send  
us the old part for duplication, as we abso-  
lutely guarantee to return at our expense all  
parts we can not duplicate.

619 N. Illinois St., INDIANAPOLIS, IND.  
Watch for Our Large Space in Motor Age

SPEEDWAY BODIES  
for FORDS

**\$100** Underslung parts with body free,  
or parts alone, \$12.50 per set.

## MORTON &amp; BRETT

811 E. 23rd Street Indianapolis, Ind.

## Hupp 32 &amp; EMF Parts

160 DIFFERENT MAKES CARS IN PARTS  
SEND US YOUR OLD PIECES  
PROMPT ATTENTION

## UNITED AUTO WRECKERS

Main Yard, 541-549 Wyoming St., Dayton, O.  
PHONE E-3067

40% OFF

List on

5000 Mile

Guaranteed

Standard Brand

T I R E S

## ARMSTRONG GREY TUBES

Guaranteed for One Year

## OUR PRICES

Size	Ribbed	Non-Skid	Tube
30x3	.....\$9.12		\$2.00
30x3½	.....11.76	\$12.30	2.45
32x3½	.....13.89	14.55	2.55
31x4	.....18.15	19.05	3.20
32x4	.....18.48	19.38	3.35
33x4	.....19.29	20.22	3.45
34x4	.....19.77	20.73	3.55
35x4½	.....27.84	29.16	4.45

10% deposit required with order, bal-  
ance C. O. D., subject to examination.

Special proposition to dealers.

## The Armstrong Tire Co.

1342-44 Michigan Ave., Chicago, Ill.

Phone Calumet 5212 and 2199

## CORD &amp; FABRIC

## T I R E S

We carry the Largest Stock of all Standard  
Makes of Guaranteed Tires in the State.

We can offer you a saving on Solid and  
Pneumatic Tires.

May We Quote You Prices?

## ACORN TIRE &amp; RUBBER CO.

1350-54 Michigan Ave. CHICAGO, ILL.

## Tires

## Tires

## T I R E S &amp; T U B E S

SLIGHTLY USED AND FACTORY REPAIRED  
TIRES AND NEW TUBES—QUALITY ABOVE ALL

The QUALITY of our tires and tubes is superlative, the PRICE  
cannot be equaled and our SERVICE cannot be excelled

A SATISFIED CUSTOMER IS OUR BIGGEST ASSET, THEREFORE.

WE MUST SATISFY YOU

Size	Used Tire	New Tube	Size	Used Tire	New Tube	Size	Used Tire	New Tube
30x3	.....\$4.00	\$1.95	32x4	.....\$7.25	\$3.05	35x4½	.....\$8.75	\$4.25
30x3½	.....5.00	2.30	33x4	.....8.00	3.25	36x4½	.....9.00	4.40
32x3½	.....5.50	2.40	34x4	.....8.00	3.40	35x5	.....9.75	4.60
34x3½	.....6.00	2.60	35x4	.....8.25	3.50	36x5	.....9.75	4.70
31x4	.....6.50	3.00	34x4½	.....8.50	4.15	37x5	.....10.00	4.75

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly, with privilege of  
examination, and balance C. O. D. Specify style of rim to avoid delay.

Our Used Tires are not guaranteed for any definite number of miles, but we will make  
reasonable adjustments on all tires that do not give service in proportion to the price paid,  
providing tires are returned to us by prepaid express. Is not this fair enough?

WE CARRY A COMPLETE STOCK OF NEW TIRES—  
WRITE FOR PRICES.

## LINCOLN TIRE &amp; SUPPLY CO.

1463 South Michigan Avenue, Dept. 1. CHICAGO, ILLINOIS

## T I R E S

## JOB LOTS

Obsolete, Surplus Stocks and  
Factory Seconds

WRITE—CALL

## BROADWAY TIRE JOBBERS

250 West 54th Street

New York

## T I R E S AND T U B E S

SLIGHTLY USED TIRES  
OBTAINED FROM WRECKED CARS AND  
FACTORY REPAIRED

Size	Tires	Tubes	Size	Tires	Tubes
30x3	.....\$ 4.50	\$1.35	34x4½	.....9.00	1.75
30x3½	.....5.50	1.45	35x4½	.....9.25	1.80
32x3½	.....6.00	1.50	36x4½	.....9.50	1.85
31x4	.....7.00	1.65	38x4½	.....15.00	2.50
32x4	.....7.75	1.60	40x4½	.....15.00	....
33x4	.....8.50	1.70	42x4½	.....25.00	4.00
34x4	.....8.50	1.70	35x5	.....10.25	2.00
35x4	.....9.00	1.75	36x5	.....10.75	2.20
33x4½	.....9.00	1.75	37x5	.....10.75	2.20
			38x5½	.....15.00	....

NEW TIRES  
NEW, FRESH STOCK  
Exceptional Bargains

Size	Tires	Tubes	Size	Tires	Tubes
28x3	.....\$ 8.00	\$1.85	35x4	.....\$20.60	\$3.50
30x3	.....8.37	1.80	33x4½	.....23.60	3.75
30x3½	.....10.80	2.20	34x4½	.....24.40	3.90
32x3½	.....12.70	2.30	35x4½	.....25.50	4.05
34x3½	.....14.80	2.70	36x4½	.....25.90	4.60
31x4	.....16.65	2.85	35x5	.....29.10	4.90
32x4	.....16.95	2.90	36x5	.....29.90	4.75
33x4	.....17.70	3.00	37x5	.....30.75	4.90
34x4	.....18.10	3.10			

ADD 10% FOR NON-SKID

\$1.00 Deposit Required With Each Tire Ordered, Balance  
C. O. D., Subject to Examination. Specify Style of Rim.

## AUTO NEEDS COMPANY

1602 Michigan Ave.  
Chicago, Ill.



Tires

Tires

Tires

# BUCYRUS TIRES

## GUARANTEED 5000 MILES

### EXCEPTIONAL INTRODUCTORY OFFER TO DEALERS

Bucyrus Tires are giving wonderful service and we are pleased to be able to place before you these extremely low prices on a 5,000-Mile Guaranteed Tire as follows:

Size	Non-Skid	Tubes	Size	Non-Skid	Tubes	Size	Non-Skid	Tubes
28x3	\$9.60	\$1.95	31x4	\$17.80	\$3.35	34x4	\$19.30	\$3.65
30x3	9.45	2.15	32x4	18.10	3.45	35x4½	26.75	4.50
30x3½	11.95	2.50	33x4	18.95	3.55	35x5	30.45	5.25
32x3½	13.85	2.70				37x5	31.20	5.50

Note:—When Ordering State Whether Straight Side or Q. D. Clincher

#### TERMS STRICTLY CASH

OUR PRICES are so low that the margin of profit does not permit us to ship goods on open account. We eliminate collection expenses, and give you the benefit of lower prices by selling for cash. We make no exception to these terms. We will ship C. O. D. if you will send deposit of at least one-third the amount of order. If You Send Remittance For The Full Amount of Order, We Allow a Cash Discount of 2 per cent. We recommend that you remit in full, thereby saving 2 per cent and the C. O. D. return charges.

## BUCYRUS TIRE & RUBBER CO.

1406 MICHIGAN AVE., CHICAGO, ILL. Phone: Calumet 1380

## Good News!

This Substantial Reduction Is Your Gain

Compare Our Prices Then Order

### QUALITY COUNTS

New Fresh Stock, Assorted Brands

Size	New Tires	Used Tires	New Tubes
28x3	\$7.80	\$5.00	\$1.75
30x3	7.60	5.00	1.75
30x3½	9.80	6.00	2.10
32x3½	11.55	7.50	2.20
34x3½	13.45	8.00	2.55
31x4	15.15	8.50	2.70
32x4	15.40	8.50	2.75
33x4	16.10	9.00	2.85
34x4	16.50	10.00	2.90
35x4	18.75	10.00	3.30
36x4	19.30	10.50	3.40
33x4½	21.45	10.50	3.45
34x4½	22.20	11.00	3.55
35x4½	23.20	11.00	3.65
36x4½	23.55	11.50	3.75
37x4½	26.95	11.50	4.30
35x5	29.10	12.50	4.40
36x5	29.90	13.00	4.85
37x5	30.75	13.50	4.55

Add 10% for Non-Skid Cases or Red Tubes. Special Prices to Dealers—Let Us Know Your Wants.

#### MAIL ORDERS SOLICITED

10% Deposit Required with Order. Balance C. O. D., Subject to Your Examination and Approval.

### SERLIN TIRE CO.

Incorporated  
1300-1302 Michigan Ave., Chicago, Ill.  
PHONES: CALUMET 3407-3408

## REAL VALUES

### HIGH GRADE NEW TUBES AND TIRES

Some PRICES on NEW TIRES and Tubes

Size	Plain	Non-Skid	New Tubes
30x3	\$7.55	\$8.90	\$1.70
30x3½	9.75	10.85	2.10
32x3½	11.35	13.10	2.25
31x4		16.80	2.60
32x4	15.15	16.95	2.75
33x4	15.95	17.85	2.85
34x4	16.25	18.40	2.95

10% deposit required with order, balance C. O. D., privilege examination.

Carl G. Wiesenmeyer  
"The Tire King"  
Springfield, Ill.

### No Deposit Required

ON OUR TIRES

## Demonstrating

All Non-Skid TIRES All Non-Skid

They Are MUCH BETTER Than the Ordinary Used Tires

Size	Tire	Tube	Size	Tire	Tube
30x3	\$4.50	\$1.75	33x4½	\$13.50	\$2.50
30x3½	7.50	1.90	34x4½	13.50	2.60
32x3½	9.00	2.00	35x4½	14.00	2.65
31x4	9.50	2.15	36x4½	15.00	2.75
32x4	10.50	2.15	38x4½	22.00	
33x4	11.50	2.25	35x5	15.50	2.85
34x4	12.50	2.35	37x5	16.50	2.95
32x4½	13.00	2.35	37x5½	18.00	
			38x5½	25.00	

5% Off for Cash in Full with Order. Otherwise, goods shipped C. O. D., subject to examination. Specify whether clincher or straight side.

Royal Tire & Supply Co.  
1461 Michigan Avenue CHICAGO, ILL.

#### Special Bargains in

### SLIGHTLY USED TIRES

The Kind That Will Satisfy All Customers

30x3	\$4.50	32x4	\$7.75	35x4½	\$9.25
30x3½	5.50	33x4	8.50	36x4½	9.50
31x3½	5.75	34x4	8.50	37x4½	10.00
32x3½	6.00	35x4	8.75	35x5	10.25
34x3½	7.00	36x4	8.75	36x5	10.25
31x4	7.00	34x4½	9.00	37x5	10.75

Send \$1.00 deposit with each tire ordered. Balance C. O. D., subject to examination. Specify if Clincher, Q. D., or Straight Side.

American Tire & Vulcanizing Co.  
Phone: Calumet 5170  
2136 S. MICHIGAN AVE., CHICAGO, ILL.

### Good Double Tread Tires, All Sizes

#### Guaranteed 3000 Miles

30x3	\$5.25	32x4	\$8.75
30x3½	6.25	33x4	9.00
32x3½	7.50	34x4	9.50
31x4	8.25	35x4½	11.50

Refiner free with each tire. One dollar deposit with all C. O. D. orders.

REBUILT TIRE CO., Kalamazoo, Mich.

#### RETREADED AUTO TIRES

Are highly serviceable if cured in the proper mold. In buying your new mold be sure that it has FIVE CLAMPS. Less clamps can not give the proper pressure.

WATER GAUGE. To know at all times you are curing with steam.

SAFETY VALVE. One that you can rely upon.

STEAM GAUGE. That registers accurately.

FLANGE. On each end of mold to prevent overflow.

BASE. That is one piece and strong enough to carry mold.

MACHINE FINISH. A retread mold must be of sufficient weight to hold heat, and be machined to a smooth finish.

THIRD CIRCLE. Not called a third and only measure a quarter.

UNIT PLAN. Each mold should be separate and independent of the other to insure easy working.

THE CRESCENT RETREAD TIRE MOLD is the only mold sold today embodying all of these features.

Write for our new catalogue, it explains it all.

#### CRESCENT MACHINE COMPANY

Hill and Forge St. Akron, Ohio

#### SUPERB DOUBLE TREAD TIRES

Are selling at one-fourth the usual tire cost to convince you of their quality material and workmanship, and are GUARANTEED 4,000 MILES.

We also carry a complete stock of New Tires at factory prices.

Size	Tire	Tube	Size	Tire	Tube
30x3	\$4.85	\$1.65	36x4	\$9.50	\$2.45
30x3½	5.85	1.70	34x4½	9.60	2.50
32x3½	6.35	1.80	35x4½	9.85	2.50
34x3½	7.50	1.90	36x4½	10.35	2.50
31x4	7.35	2.10	37x4½	11.00	2.50
32x4	7.60	2.20	35x5	11.10	2.50
33x4	7.85	2.25	36x5	11.35	2.00
34x4	8.10	2.35	37x5	11.60	2.60
35x4	8.50	2.40			

#### REFINER FREE WITH EVERY TIRE

When ordering state whether you want straight side or clincher, plain or non-skid. Send \$1.00 deposit for each tire ordered, balance C. O. D., subject to examination. We allow a special discount of 5% if you send the full amount with the order.

#### SUPERB TIRE & RUBBER CO.

2549 Indiana Ave. - - - Chicago, Ill.

#### AUTOMOBILE DEALERS

Etc. Sell Double Tread Tires and Make Real Money.

Write us for proposition.

#### STATE RUBBER TIRE CO.

Dept. M  
126 E. 33d St. - - - Chicago, Ill.

#### DEALERS—MANUFACTURERS

We Are in the Market For New or Obsolete

stocks of high-grade tires, tubes and accessories. Will make you a mighty attractive proposition.

Address Box E-1029, care Motor Age.

Rebuilding and Repairing

Rebuilding and Repairing

Rebuilding and Repairing

## Where Cylinder Grinding Is a Superlative Art

No one factor alone insures perfect cylinder grinding.

**EQUIPMENT** Equipment is probably the most important factor. Cylinder Grinding by the Green Process is done on accurate, special Brown & Sharpe machines acknowledged to be the best of their kind in existence.

**PERSONNEL** The men entrusted to do cylinder grinding is another important factor. "Green Process" machinists receive their training in designing and producing motors in the plants of automotive manufacturers whose cars are famous for performance. One and all are picked men, possessing a sensitive sixth sense about motors.

**STOCK** At the command of these men is an immense stock of parts of every conceivable size and design. For example, 20,000 finished piston rings in all standard, special and oversizes.

**GUARANTEE** The least you can expect from cylinder grinding by the Green Process is a restoration to original factory efficiency. Our records show that we exceed this mark in a great majority of instances.

**BOOKLET** The Green Book will help to get us acquainted. We are proud of the letters it contains from our customers. Will you write for it today?

### Some Famous Products of GREEN Manufacture

Alumnite Pistons—Alumnite Connecting Rods  
Power Plus Cylinder Heads for Ford Cars

*See our display advertisement in this issue*

## GREEN ENGINEERING CO.

Dayton, Ohio

## Auto Engine Works

St. Paul

Minnesota

### A Record of 15 Years' Continual Service

Fifteen years ago the Auto Engine Works turned out its first piece of work. Since then the organization has enjoyed a steady, healthy growth, based on expert work, efficient service and honest methods. Today we are the largest concern of our kind in the entire northwest. Five Heald Grinders are in constant operation night and day. More than 50 men are employed in our shops.

We specialize in cylinder and crankshaft grinding, gear cutting and replacement of steel ring gears.

"Once a Customer, Always a Customer," is the foundation for our success.

We shall be glad to serve you. Write.

### DEEP WRIST PIN SCORES IN CYLINDERS

Filled with special white metal alloy and refinished, permitting use of old piston and rings. No warping or distortion. Satisfaction guaranteed. Cylinders returned in 24 hours.

**AUTOMOTIVE ENGINEERING CO.**

Dayton, Ohio

## Steel Gear Rings

For Self-Starters

For replacements or new installations  
Silent Chain Sprockets

For

Generator & Magneto  
Drives

*Our Prices Will Interest You*

The Adapt Machinery Company  
1624-1632 S. Wabash Ave. Chicago, Ill.

*Send it to—*

## HARTFORD Cylinders Reground

Pistons and Rings accurately fitted.  
Best equipped plant in New England.  
Prompt Delivery.

Charter Oak Machine Co.  
438 Asylum St.  
HARTFORD CONN.

## Cylinders Reground

Fitted with light grey iron pistons, leakless rings and pins. Popular prices, quality work. Largest and oldest established plant in the Northwest.

McCADDEN MACHINE WORKS  
ST. CLOUD MINNESOTA

*Attention*

## CAR OWNERS

Winter driving demands strong engines. Why not give that trouble a knockout punch by having the

**Cylinders Reground**

AND EQUIPPED WITH NEW  
PISTONS, PINS and RINGS

by the  
**BUTLER MFG. CO.**  
INDIANAPOLIS, IND.

## Cylinders Reground

Scored or cracked cylinders welded. Oversize Pistons and Rings furnished.

Emerson Manufacturing Co.  
1075 Gratiot Ave. Detroit, Michigan



Rebuilding and Repairing

Rebuilding and Repairing

Rebuilding and Repairing

# THE LARGEST PLANT IN THE U. S.

AND THE BEST EQUIPPED—SPECIALIZING ON  
crank shaft regrinding, cylinder regrinding and rearing of scored cylinders, is at your service. We do not file and lap crank shafts but grind them on special machines. We have a battery of machines for cylinder regrinding and use the famous Eagle process for scored cylinders. We also shrink starter steel ring gears on fly-wheels.  
NO WAITING FOR WEEKS—QUICK SERVICE—ABSOLUTE SATISFACTION  
A TRIAL IS MOST CONVINCING—SHOOT 'EM IN

STAFFORD MOTOR CAR COMPANY

KANSAS CITY, MO.

NOW IS THE TIME to get into the cylinder regrinding business. Automobile owners are having their cars overhauled. Heald No. 60 Cylinder Grinding Machine will start and keep a successful business. Write for Heald's Blue Border Bulletins, Series No. 6.

THE HEALD MACHINE CO.

Worcester, Mass.

HAVE  
YOUR

## SCORED CYLINDERS

REPAIRED  
BY THE

EAGLE Patented PROCESS

We do not heat the cylinder or enlarge the bore, thereby saving the expense of new pistons, rings and pins. Mechanical Process. All Work Guaranteed. 24-Hour Service.

SHIP YOUR WORK TO NEAREST ADDRESS

Eagle Machine Co., 24 N. Noble St., Indianapolis, Ind.  
Detroit Auto Machine Co., 1682 Gratiot Ave., Detroit, Mich.  
Stafford Motor Car Co., 22nd and Campbell St., Kansas City, Mo.

Litter Motor Machine Co., 240 N. 4th St., Columbus, Ohio.  
Trindl Machine Works, 57-61 E. 24th St., Chicago, Ill.  
Gladish Machine Works, 50P Broad St., Chattanooga, Tenn.

For territory rights write to  
**EAGLE MACHINE CO.,**  
Indianapolis, Ind.

## THE TRINDL COMPANY

57-59-61 East 24th Street

Formerly Trindl Machine Works

SPECIALISTS IN

CHICAGO, ILLINOIS

PISTONS—PISTON RINGS—WRIST PINS

CYLINDER GRINDING

Scored Cylinders Repaired

By Patented Nickel Steel Alloy Process

CRANK SHAFT GRINDING

Factory Distributors of

"GILL"

QUALITY  
SERVICE

PERFECT ONE PIECE PISTON RINGS

PHONE COLISEUM 2320

Write for Our  
Illustrated Book-  
let.

## CYLINDER GRINDING

Manufacturing of oversize Pistons, and Wrist Pins, for all makes of Cars, Trucks and Tractors. All work guaranteed. Best workmanship.

Send for Our Price List

MILWAUKEE CYLINDER GRINDING CO.  
Humboldt & Concordia Ave., Milwaukee, Wis.

## Cylinder Reboring

Welding and General Machine Work

We are especially equipped to handle the above lines and guarantee satisfaction. Prompt Service Expert Workmanship

OLSON & DETLIE CO.  
219-25 W. 7th St. Sioux Falls, S. D.

## SCORED CYLINDERS

REPAIRED BY THE ONLY SUCCESSFUL PROCESS

LAWRENCE PATENT PROCESS

SEE our display adv. in this issue for list of plants where to ship cylinders

## CYLINDERS REGROUND

\$5 to \$10 per cylinder. All our work guaranteed. Rings. Alloy pistons, from \$1.50 to \$3.50 per cylinder, extra. Ford cylinders reground and fitted with pistons, rings, wrist-pins and bushings.

Racing Motors a Specialty

D. R. NOONAN Paris, Illinois

SEND  
YOUR

## CYLINDER GRINDING TO KANSAS CITY

We have a fine plant, equipped with the most modern facilities for cylinder grinding and fitting of pistons and wrist pins. Our workmen are experts. All jobs inspected before shipping.

QUICK SERVICE AND ATTRACTIVE PRICES TO GARAGE AND REPAIR MEN

1505 McGee Street

HARRY LEE MACHINE WORKS

Kansas City, Mo.

## ALL PARTS DUPLICATED

Cylinders Reground. General Machine Work for Foreign and American Cars. Welding of All Metals. Manufacturers of CATELAIN HOSE COUPLING. U. S. Shock Eliminators. Authorized Ever Ready Battery Service Station and Sheet Metal Work. QUICK SERVICE: SATISFACTION GUARANTEED

ANDRE CATELAIN

1446-8 Indiana Ave. CHICAGO, ILL.

## CYLINDER AND CRANKSHAFT GRINDING

Oversize Piston, Rings and Wrist Pins made to fit. Skilled mechanics and Special Accurate Machinery. WRITE FOR OUR BOOKLET FOR PRICES AND USEFUL INFORMATION.

MODERN AUTO REPAIR CO.

4601-3-5-7-9-11 &amp; 13 Olive St., St. Louis, Mo.

## CYLINDER REBORING

FOR PASSENGER CARS—TRUCKS—TRACTORS  
We have the capacity and the skilled workmen. Satisfaction guaranteed. "ONCE A CUSTOMER—ALWAYS A CUSTOMER" is our motto. We are also specialists in high grade PISTONS, RINGS and PINS. Special attention given to Trucks and Tractors.

PARK MACHINE CO.

22 West 3rd Street ST. PAUL, MINN.

## TRY US ONCE!!

On cylinder grinding. New equipment and we are in a position to give you prompt, economical and satisfactory service. New pistons, rings and pins if desired.

Send for our price list

ST. PAUL AUTO CYLINDER GRINDING COMPANY

1152 Rice St., St. Paul, Minn.

## Expert Cylinder Grinding

Oversize and standard pistons, rings and wrist pins. We use our famous Double Lap Joint piston rings. Scored and cracked cylinders repaired. Work guaranteed.

WOODRUFF ENGINEERING CO.

5315 Euclid Avenue Cleveland, Ohio

## CYLINDERS REGROUND

Piston Rings and Wrist Pins Fitted. Machine of all descriptions.

DELCO IGNITION SPECIALISTS

WM. BENDER

1829 Indiana Avenue Chicago, Ill.

## WELDING OF ALL METALS

Scored Cylinders Repaired

CYLINDERS REGROUND—PISTONS FITTED

Ask about our guarantee.  
A. PONDELICK, 226 S. Winchester Ave., Chicago

## STEEL RING GEARS

for starter fly wheels. You can install the gear yourself. We show you how—or send 'em in.

## CYLINDER GRINDING

Quick service and expert work.  
WRITE TODAY

CRAGO MACHINE WORKS

1416 Walnut St. Kansas City, Mo.

## CYLINDERS REGROUND

including new pistons and rings. Any size up to 5-inch bore—\$5 to \$10 per cylinder. All our work guaranteed. Quick shipments. Let us prove our ability on your next job.

NEUPERT MFG. COMPANY

82 Lark Street Buffalo, N. Y.



**Cylinders Reground**Pistons, Rings, Wrist Pins, Fitted  
Gear Cutting of All Kinds  
Magnet Parts and Repairing  
Official Sims-Huff Service Station**E. H. ODOM BROTHERS COMPANY**  
19 James St. ATLANTA, GA.**EXPERT REBORING**of Cylinders and Welding of Broken Parts constitutes  
our main business. On badly scored cylinders we  
use old pistons by putting sleeve in cylinder. We  
maintain one of the largest and best equipped plants  
in the West for this work. Try us for real satisfaction.**STANDARD WELDING & MACHINE CO.**  
416-418 East Second St. Des Moines, Iowa**Starting, Lighting and  
Ignition Experts**THE PELLET MAG-  
NETO COMPANY with its  
highly trained organization  
and its irreproachable Sales,  
Service and Stock Depart-  
ment places at your disposal**"THE SERVICE WITH THE SPARK"**Send for our 224-page catalog just  
issued—it contains valuable information.**Pellet Magneto Company**  
25th and Wabash Avenue Chicago, Illinois**WE GRIND**Cylinders and fit special heat-treated Pistons.  
Welding of all kinds of Metals. Gear Cutting  
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Variable Speed.....	600-1200
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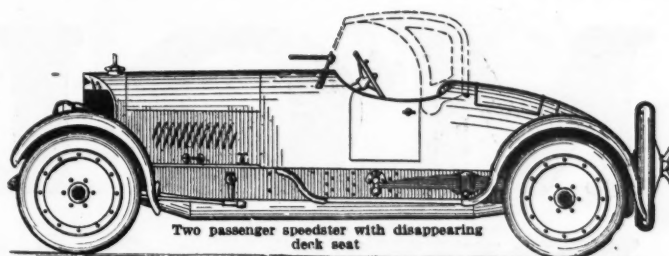
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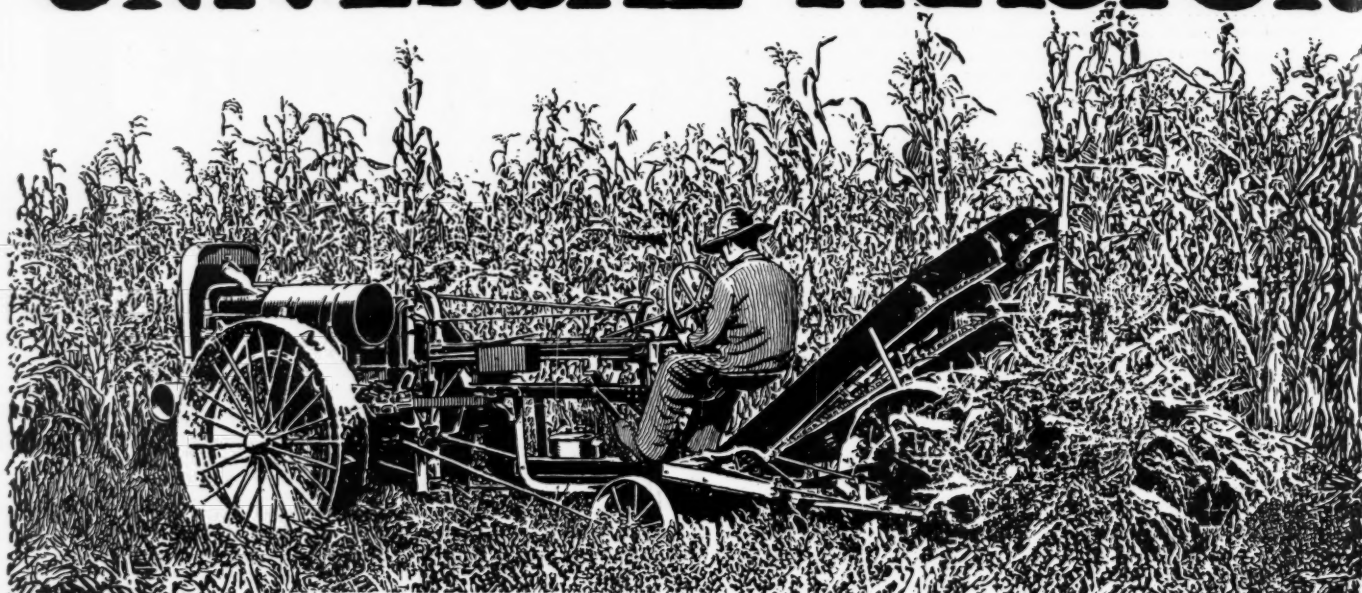
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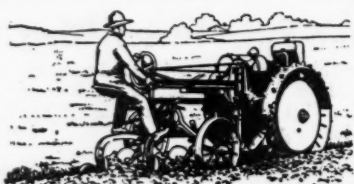
just twice the size of the Moline-Universal—almost 2 H. P. behind.

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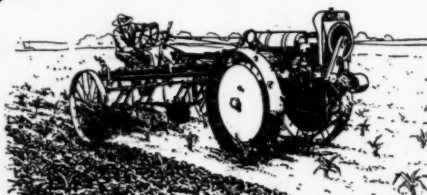
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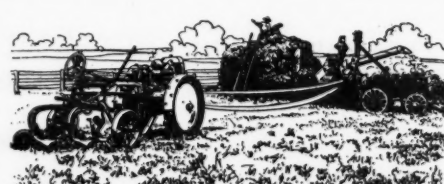
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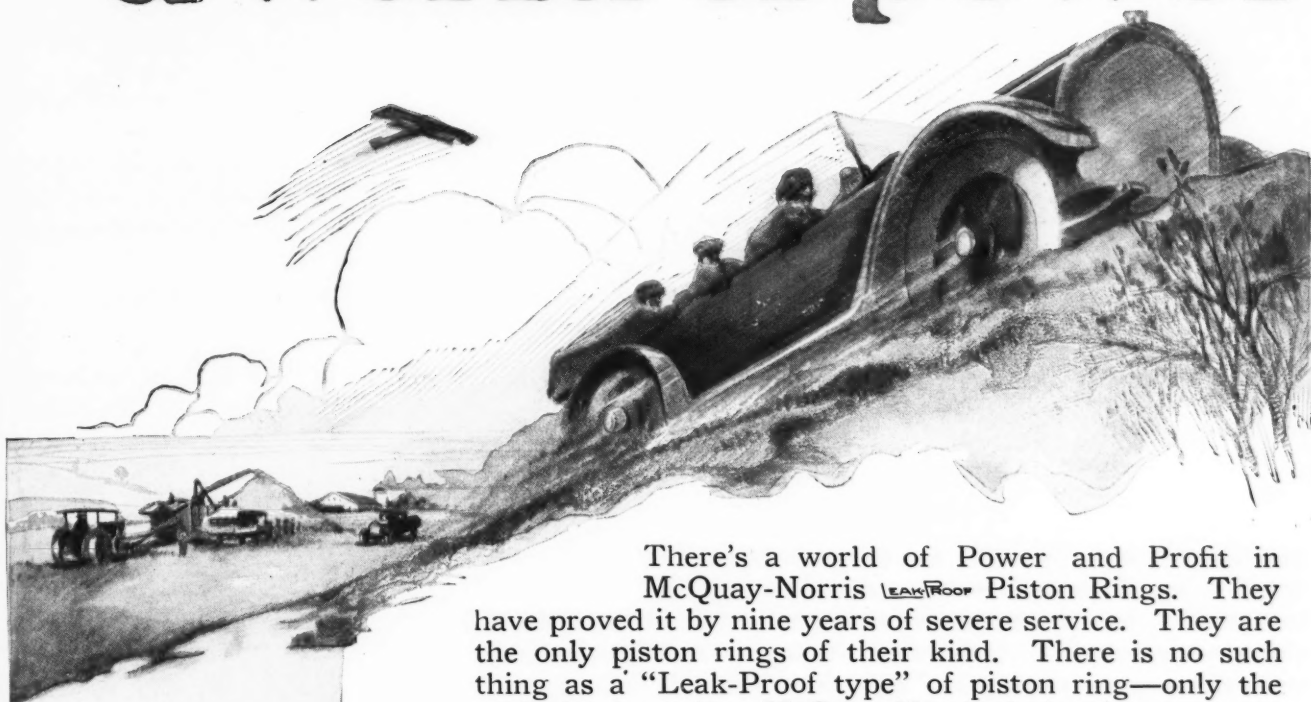
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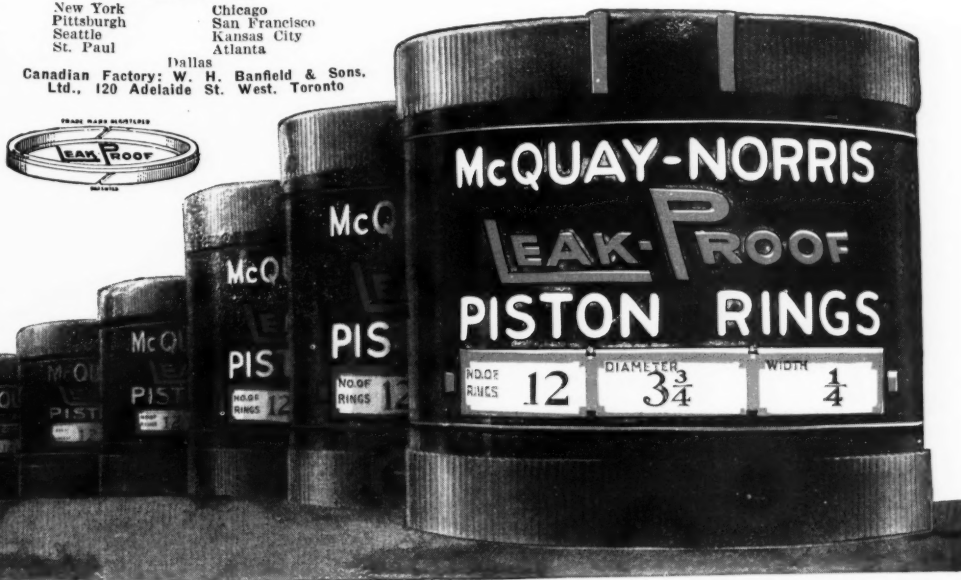
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